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# Notes and Comments

## An Honest Budget

A GREAT many hard things will be said and written about the Budget which Mr. Chamberlain opened in the House of Commons on Tuesday. It has, however, one favourable aspect which differentiates it from post-war Budgets. It is an honest statement of the financial position of the Government. That position is grim enough in all conscience, but there is some satisfaction in knowing the worst. There is no juggling of revenue between one year's accounts and another. There is no raiding of nest eggs and calling up of paper reserves. There is no spending on the ordinary needs of the year out of borrowed money. In fact, there is none of the gambling or speculation, or in the worst case, sleight of hand, to which some of Mr. Chamberlain's recent predecessors had so painfully accustomed us. If it is not actually too late, the British Budget is only just in time in being honest and above board.

This facing of realities, however hard, is admirably exemplified in Mr. Chamberlain's refusal to take into the national accounts on one side or the other payments on account of war debts or reparations. He again made it clear in the most formal and authoritative manner that Great Britain leads the world in a new policy of all-round cancellation. This is the most hopeful feature of the entire Budget statement. It is a frank recognition, no matter how many international conferences have yet to wrangle about it, that the whole of the political money represented by War debts and reparations no longer exists. Every financial expert knows that this is so, and that payments under these heads can never again be fitted into the regular machinery of either the creditor or the debtor States. There would indeed be no ray of hope at all on the international trade horizon if the British Government did not firmly and unflinchingly continue along the path of sanity to which Mr. Chamberlain has committed it.

## But a Depressing Document

STILL, when proper weight has been given to such favourable factors as these, the Budget cannot be regarded as anything but an extremely depressing document. There is not the slightest alleviation of any of the burdens which fall with crushing effect on direct and indirect taxpayers alike. Income tax and surtax remain at levels so prodigious as to leave the business community little hope of a revival of confidence and to give it the least possible stimulus to fresh enterprise. Mr. Chamberlain paid a thoroughly well-deserved tribute to the heroism of the income tax paying class, which by accepting the unprecedented sacrifices demanded of it last autumn bore the lion's share in making the national accounts balance. The curious mentality of the Treasury, however, was again shown by the absence of any reference to the equally fine record of the surtax paying class. Because businesses pay income tax on their hard won profits and not surtax, the Treasury apparently regards the surtax payer as just a wealthy individual whose income can be whittled away without detriment to the trade and commerce of the country. In point of fact, the surtax paying class is by far the greatest reserve that business has for the provision of new capital, without which there can be no expansion of employment.

Income tax and surtax payers accordingly are called upon to pay exactly the same scales as in the year of gravest emergency, but almost universally out of lower incomes. Nobody can be surprised at Mr.

Chamberlain's estimating a substantially lower yield from these sources than in the year just ended. The only doubt is whether he has not been far too optimistic in allowing for a decline of only 38 millions. Here, in any event, is the writing on the wall. One of the few really fervent cheers he received was for his declaration that the limits of direct taxation had been reached. Not only is there no remission of direct taxation, but in order to square his accounts for the coming year Mr. Chamberlain found himself confronted with the need of raising nearly 35 millions of new revenue on the existing basis of taxation. He proposes to obtain this sum entirely from indirect taxation, the bulk of the amount from tariffs and a considerable contribution from the resumption of the tax on tea. Look at tariffs how we will, there is no escaping the fact that in so far as they are not solely protective but bring fresh revenue into the Exchequer, they cannot fail to increase the burden on the consumer. We shall never cease to argue that for every pound produced by a tariff the State should take off a pound from other forms of taxation, preferably the income tax. What has actually happened is that the burden of the Budget spread all over the community is far heavier than that of the staggering emergency Budget passed last autumn.

## The Key to the Difficulty

ALL this is palpably wrong and the key to the whole difficulty can be found in the unexpected burst of cheers with which the House of Commons greeted Mr. Chamberlain's perfunctory reference in his peroration to the need of strict economy. The plain truth is that the Government has missed a priceless opportunity which the nation offered to it with both hands, and which may never recur. *The Times* has shown that on a Budget reaching the collossal total of 848 millions the best the Government has been able to do has been to effect economies not amounting to more than 14 millions, if the changes in unemployment payments are excluded. The estimates for the so-called spending departments in the coming years were a bitter disappointment to the voters who gave the Government a blank cheque at the general election, and particularly to the business classes. Even more disquieting was the failure of Mr. Chamberlain in his Budget speech to indicate any direction in which further economies would be sought. The Geddes Report has been forgotten again, and such war-time luxuries as the Ministries of Labour and Transport are allowed to survive with their swollen and expensive staffs. Indeed, it is highly probable that with the hordes of new officials required by the Government for their tariff and wheat legislation, the bureaucracy will exceed in numbers that which even the Labour Government found sufficient for its needs. It is astonishing that the Government cannot see what is plain to every business man, that the nation simply cannot afford to support this huge establishment. It will have to be cut down ruthlessly when the money is not there to support it, and if the Government does not tackle the problem at once, it may make it impossible for Great Britain to raise its head for a generation in the markets of the world. It is only too plain that the campaign for national economy must be revived immediately.

## Large Scale Business

IN a business world that has been shaken to its foundations by the financial upheavals of recent years, Sir Harry McGowan did well to devote a part of his address as chairman of Imperial Chemical Industries, Ltd., at the annual meeting last week, with the implications of large scale business, and to emphasise that specific failures do not affect the validity of a principle. While it cannot be concealed that there is a keenly divided opinion on the enduring merits of large scale organisation, it must be conceded that the experiences of Imperial Chemical Industries afford an outstanding example of stability, and the fact that its trading results in the most difficult year in industrial history exceeded the most sanguine expectations of its directors must be recognised as a testimony to the soundness of the organisation. Grounds for Sir Harry McGowan's review of the principles followed by the company are to be found in the recent expression of doubt as to the soundness and permanence of very large concerns, especially when their ramifications have a world-wide scope. As is not unusual, these doubts spring from a few striking cases of failure. They rest upon the reasoning that what has proved true in two or three cases must be true in general.

The I.C.I. organisation has been built upon firm foundations and is as free as it can be made from the defects which in other cases have led to trouble. Under its scheme of administration, those members of the board who devote all their time to the business have been freed from the burdens of defined executive duties. Concentrated study can accordingly be given to new problems as they arise. Fully cognisant of the company's general policy, each of these directors is freely at the disposal of any member of the organisation who needs general or particular guidance upon some aspect or point of the work with which he may be concerned. Moreover, they are in daily contact with one another, and with the President and Sir Harry himself, not only through the normal board days, but more freely in their fixed and frequent meetings on the general purposes committee and finance committee, and still more frequently and intimately in the daily task of guiding the business. They have no secrets from one another. "Our ideal," said Sir Harry, "is a thoroughly dove-tailed executive staff, well-balanced, self-supporting, with a clearly defined policy, so that its full power shall not be impaired or even shaken by the loss of any one individual."

## The Calendar

**April 23.**—North of England Institute of Mining and Mechanical Engineers. General eMeting. 2.30 p.m. Lecture Theatre of the Institute, Newcastle-on-Tyne.

**April 25.**—Ceramic Society. Annual General Meeting. 7.30 p.m. North Staffordshire Technical College, Stoke-on-Trent.

**April 25.**—Royal Society of Arts. "Recent Researches on the Nature and Function of Vitamins." J. C. Drummond. 8 p.m. John Street, Adelphi, London.

**April 26.**—Royal Photographic Society, Scientific and Technical Group. "Anamorphosis and other Optical Devices employed in Kinematography and Sound Recording." H. W. Lee. "A Survey of the Lunar Surface." H. G. Tomkins. 7 p.m. 35 Russell Square, London.

**April 27.**—Royal Society of Arts. "Education for Commerce." H. Ramsbotham. 8 p.m. John Street, Adelphi, London.

**April 29.**—Institute of Chemistry. "The Development of Conceptions based on the Electronic Theory of Valency in Organic Chemistry." Professor Robert Robinson. 8 p.m. 30 Russell Square, London.

# Contradictory Views on Paint Consistency

## More Experimental Evidence Needed

Mr. D. H. S. Forbes read a paper entitled "Some Contradictory Views on Paint Consistency," at a meeting of the Oil and Colour Chemists' Association held in London on Thursday, April 14. Mr. Noel Heaton, president, was in the chair.

Mr. Forbes said that the consistency of paint is of the first importance in its manufacture yet very few paint manufacturers have attempted to deal with it scientifically. First a paint must be of the right colour, then its consistency must be suitable for its method of application—brushing, spraying or flooding, and finally it must dry to the right kind of film—matte or glossy, retaining brush marks or levelling out, and having the necessary protective power and durability. Up to the present time, raw materials had been chosen and proportions adjusted by purely empirical methods so as to produce paints with the properties required, and it was evident from the practical results that these methods were working tolerably well in experienced hands. At the same time there was an unsatisfactory background of batches that turn out too thin, or too tacky, or slightly gelatinous in spite of quite reasonably good care in the mixing and measuring, showing that there is a need for a greater control over the materials used. The failure of personal skill to avoid these troublesome variations demanded that the question of consistency should be attacked scientifically, in order that it may be understood and brought under intelligent control.

### Variation of Consistency

In practice, two methods were used for varying the consistency of paints; the first by varying the viscosity of the liquid part, and the second by varying the pigment/vehicle ratio. It was obvious that a paint made with a thick liquid would be stiffer than one made with the same quantities but using a thinner liquid, other things being equal, and it was equally obvious that increasing the amount of dry colour in a given amount of oil would make the paint thicker, but it did not follow that the same proportion of either of two liquids with the same viscosity would give a paste with the same consistency, nor that the same proportions of two pigments with the same specific gravity would give similar pastes in a given liquid. Actually the wildest variations occurred and since flocculation and yield value were evidently connected, the first step in understanding consistency must be the explaining of flocculation and why it is accompanied by yield value.

There were two rival theories of flocculation, the electrical theory and the cohesional theory. The electrical theory was the one generally found in books. It was noticed early in the growth of colloid chemistry that small particles of solids sometimes remained permanently suspended in liquids in which their specific gravity should have made them sink, and the reason for their suspension appeared to be that they repelled each other. It was also noticed that, when this state of affairs occurred in water, the particles showed the movement in an electrical field called cataphoresis, indicating that each carried an electrical charge of the same sign. Consequently, it was suggested that the mutual repulsion was the electrostatic repulsion between their charges. This was only a theory of suspension, flocculation being regarded for a long time merely as what happened when the charges were neutralised. It was supposed that the particles, when discharged, ceased to repel each other, and so clustered together and settled. Later, when further facts had to be accounted for, the theory was made much more complex, the chief complexity bearing on the present matter being the Helmholtz conception of a double electric layer. The existence of this layer seemed fairly well established experimentally, and numerous interesting phenomena were attributed to its effects. The particular one bearing on the consistency of paint was that put forward by Rideal to explain the positive nature of flocculation. Dr. E. K. Rideal, in his "Introduction to Surface Chemistry," suggested that an attraction may exist between two flocculent particles, because when they come into contact, their double electric layers can unite to form a single skin enclosing both.

A slightly different version of the electrical theory suggested in some text books was that electrostatic repulsion holds the particles apart as long as the surface charge is present, but that on the removal of the surface charge, surface tension forces are left unopposed, and proceed to draw the particles into the groups that are characteristic of flocculation.

Starting from the electrical theory, it was plain that Rideal's theory about the joining of double electric layers was in itself a theory of yield value also, because any force tending to hold two particles together was a force to be overcome before the particles could be separated again, and the effect of a shearing force in overcoming the yield resistance of a paste was to move the particles past each other. Accordinging to Rideal's theory, before the particles could be pulled apart from each other, their joined double electric layers must be broken and the part missing from the area of contact must be reconstituted. Once that was done the paste was free to flow as a liquid.

Dr. Schofield and Mr. Scott Blair, while agreeing in the main with the electric theory and Rideal's proposition, had found it necessary to add a mechanical and a molecular dynamic conception. In their work on clays and soils they recognised that a certain amount of the yield value of very thick pastes was the result of the mechanical jamming up of particles. The rest they attributed to the rigidity of the liquid when it was in very thin layers between particles, the yield value of thin pastes being put down entirely to this. The rigidity of the liquid between particles they regarded as the result of a restriction of the thermal movement of the molecules. This restriction, or partial immobilisation, was accompanied by a lowering of free energy, and a shearing process, which distributed the molecular arrangement, would increase the free energy and therefore involve the performance of work.

From the cohesional point of view, a somewhat similar theory of the rigidity of thin layers of liquid had been suggested by A. de Waele, who put it down to the orientation of polar molecules. For these purposes it would be safest to define a polar molecule simply as a molecule with one end different from the other in its response to a force of molecular attraction.

### Importance of Yield Value

The consistency situation now, therefore, amounted to this; yield value is the first and most important problem of paint consistency and flocculation is generally recognised as the commonest apparent cause of it. To account for the facts there are the two schools of thought, the electrical and the cohesional, one of which must be wrong. Each has its own version of what causes flocculation, and each has been amplified in different ways to include yield value. There are the two ideas that have grown from the electrical theory—Rideal's uniting of the double electric layers and the more comprehensive Schofield-Scott Blair theory of electrostatic repulsion opposed by immobilisation. From the cohesional point of view there is the de Waele polar molecule suggestion and the purely capillary aspect. As the matter now stands, when the chrome yellow in a batch of paint becomes coarsely flocculent and turns the batch into a stiff jelly, the works chemist has to conclude either that (1) the charges on the particles have been wholly or partially neutralised, and (a) the double electric layers have united, or (b) the particles are immobilising the liquid molecules; or (2) that the liquid is not wetting the solid, and (a) the solid is rigidly orienting the polar molecules in the liquid, or (b) the liquid is trying to force its way out from the smaller interspaces to the larger. The works chemist has then to act accordingly.

### A Tangle of Theories

When a subject became tied up like this in a tangle of contradictory theories and conjectures, destructive criticism was largely a waste of time, and the wisest course was generally to collect some more experimental evidence; yet in this case there were signs that the views here contrasted were not genuinely contradictions of each other so much as views of

the same problem from different angles. Rideal's proposition was the view from the standpoint of physical chemistry and the ionic theory, the Schofield-Scott Blair idea was the view suggested by the properties of aqueous clay pastes, the de Waele theory was the approach from the direction of oil paints and the action of "dispersators," while the capillary theory was the aspect from the physics of wetting. Each of these was an attempt to explain the general facts along the lines suggested by the properties of a particular class of substances, and while they are plainly at variance with each other as they stand, each has its own basis of experimental work to support it. Probably, if all the items of existing evidence could be seen in due proportion to the whole, there would be found enough already available to clear up the broad essentials of the problem, but at present each experimenter was translating his discoveries in terms of his own theory. Yield value was obviously a composite effect—the sum of the results of all the ways in which a paste at rest differs from the same paste in motion. A paste left at rest would naturally decrease its energy by any possible internal readjustments, mechanical, ionic, molecular or capillary, and energy would be absorbed in restoring the disarranged condition. The problem was, therefore, rather that of deciding which type of rearrangement predominates in causing yield value than of assigning the whole effect to any one of the suggested causes, provided no fundamental flaw existed in any of them.

Whatever the truth might be, the most practical line of attack was the correlation of measurements of consistency with measurements of anything suspected of affecting it. By plotting the one set against the other it could soon be decided whether there was any connection or not, and to some extent work of this kind on paints was being attempted by a number of workers. On the purely empirical side, F. H. Rhodes and W. J. Jebens had explored the effects of water and soaps on linseed oil paints, while on the theoretical side H. Harkins had measured the heats of wetting of powders by liquids, Bartell and Osterhof had measured the pressure with which one liquid displaces another from a paste and McMillen had compared plastometric measurements of lithopone pastes with contact angles calculated from displacement pressures. This last pieces of work, instead of demonstrating the applicability of the cohesional theory or otherwise as might have been expected, only raised another contradiction. It appeared that the cohesional theory applies, but backwards; the lack of wetting and a high contact angle give dispersion and a mobile paste, while good wetting produces flocculation and a high yield value.

### Points from the Discussion

Mr. A. DE WAELE expressed the view that there is not so much difficulty in reconciling the electrical and cohesional theories of flocculation as might seem to be the case from what Mr. Forbes had said. The author was not quite right in suggesting, as he did, that in the paper in 1927 dealing with the de Waele theory, there was any mention of the orientation of polar molecules. If there was such a reference then it must have been a printer's error or a fault on his own part. There was an orientation of molecules whether they be polar or non-polar provided there was some degree of wetting, and in all the cases which had to be dealt with in paint technology there was some degree of wetting and therefore there was orientation of the molecules, whether they were polar or non-polar.

Mr. S. W. KENDALL said it had been indicated that the paint industry as a whole rather attempted to control consistency by varying the proportions of solids and liquids in the paint compositions. That, however, was not true to-day to the extent that it was true five years ago. Wetting was one of the most important things to consider, and recent American work seemed to have tended to dispose definitely, from the practical standpoint, of the electrical theory of flocculation. Work had been done in which paint compositions had been subjected to electrostatic fields of varying strengths, a watch being kept under the microscope to see if there was any migration of the actual pigment particles to either the negative or the positive pole, and the results in practically every case had been negative, not in the electrical sense but from the practical point of view. There was very little, if any, motion of the pigment under the influence of the electrical field. When it was considered that every solid pigment used in paint technology showed more or less the property of adsorption to either water or gas in the surface of the pigment particle, it was possible to visualise the important effect of wetting agents in securing contact between paint vehicles and pigments.

### Swelling Properties of Clay

Mr. R. K. SCHOFIELD said one of the most striking things about a clay when placed in certain liquids, and particularly water, was its property of swelling. When the clay was flocculated, the swelling proceeded to a certain extent but even when the swelling was complete, the material still showed rigidity. It still retained its shape under considerable, if not great, force, and he did not think it was possible to visualise the swelling in any other way than that the water —supposing it was water—penetrated between the clay particles and that in the swollen state the clay particles were not in contact with one another but were separated by a small volume of water.

Mr. J. A. F. WILKINSON said that some extraordinary interesting results had been obtained from such work as he had been associated with in connection with plastometric measurements of paint and it was unfortunate that more of this class of work could not be done. A feature which had surprised him was the manner in which an ordinary and easily constructed plastometer determined quite small changes in the properties of a paint or paste. For instance, in the case of a quick drying paint, drying within one or one and a half hours, there was a distinct alteration in the time of flow if a tin was opened and left for half an hour. It was not a question of evaporation of solvents but simply, apparently, a slight oxidation that had occurred. This rather suggested a difficulty in being able to repeat results, but so far as his experience went it was quite easy to repeat results even if a tin of paint was kept for a year provided no livering occurred, and provided it was stirred carefully. At the same time, it was possible to use a plastometer as a very delicate means for following any changes that might take place.

### Small Impurities

Dr. J. O. CUTTER commented on the industrial importance of this subject. Although a large number of papers had been prepared it was often difficult to interpret the exact meaning of the phenomenon which the writers had observed but apparently had been unable to express in English or any other language in a manner which others could thoroughly understand. One fact was that if any attempt was made to get chemical and physical purity in a pigment it was impossible to get dispersion of any type or kind. Therefore, it was a question of impurities, and small impurities played a very large part. As to the rigidity of a paint media, he doubted whether any paint media possessed any rigidity at all. Valuable experimental work had been done on the change in the properties of a paint under different rates or shear but chiefly, unfortunately, in America, and the results tended to show there was no such thing as rigidity or yield value.

The PRESIDENT said that if one took two sample of white enamel, in one of which the pigment and vehicle were thoroughly well dispersed and in the other the opposite was the case, and if these samples were allowed to stand side by side for a time, it would be found that in the case of the bad dispersion there was a hard settlement at the bottom and a cloudy liquid at the top. In the other case the separation took much longer and when it did occur the liquid on the top was perfectly clear. He had noticed that for years, and he could not see how it agreed with the theories of the forces at work causing flocculation and de-flocculation.

Mr. FORBES said he could only account for the phenomenon mentioned by the president on the ground that there were two types of particle. As to impurities being present, he had noticed that dispersion almost always occurred when there was something which could be called an impurity present. It was rare in anything like a pure liquid. He still maintained there was difficulty in reconciling the electrical and the cohesion theories and as to whether particles are sheared in roll mill practice, he had doubted it himself and was glad to hear that other people doubted it. If any particle size reduction took place in roll mill grinding it could only be by attrition. He could not imagine a shearing force that would smash a particle, apart from that.

# The Chemical Industry of Sweden

## Electro-Chemical Products and the Match Trade

*The chemical industry and trade of Sweden was recently the subject of a special survey by the United States Department of Commerce. The following extracts are of topical interest in view of the financial position which has arisen following upon the death of M. Ivar Kreuger and consequent revelations concerning the affairs of Kreuger and Toll, the holding company of the well-known Swedish Match Trust, which claimed to supply 80 per cent. of the world's match requirements.*

CHEMICAL development in Sweden, although handicapped somewhat by the lack of adequate coal resources and rock salt, has been carried out principally along lines dictated by the economic environment of the country and revolves rather closely about the natural wealth in timber and iron ores. Absence of coal as an industrial power resource has led to the harnessing of numerous waterfalls in the generation of electric power, and at the present day there is hydro-electric production of 1,500,000 horse-power annually—a direct stimulus to the growth of an electrochemical industry within the country. Total production of chemicals amounts to £13,000,000 per year, of which 17 per cent. is accounted for by the match industry. Exports are valued at £4,000,000 per year and imports at £7,000,000.

### The Match Trade

The match industry is largely an export industry, over 95 per cent. of the total production being shipped annually to foreign markets, the principal overseas customers, in order of their importance, being Great Britain and Colonies, China, Netherland, East Indies, United States, Turkey, Greece and France. Although Swedish match exports declined about 10 per cent. in 1930 as compared with 1929, this loss is offset considerably by the match factories which the central organisation is operating in foreign countries. It is estimated that match production in Sweden in 1931 will be 15 per cent. below peak 1929 production. The well-known Swedish Match Trust maintains its own potassium chlorate, yellow and red phosphorus and phosphoric acid plants, and although match stem wood was formerly imported, an increasing use of domestic wood for both stem and box is becoming evident. Paper for wrapping is supplied by paper mills controlled by the match organisation.

Explosives manufacture is also important, its development being coincident to the extensive ore-mining activities of the country and heavy blasting requirements. This industry, which has been gradually expanding its export trade, affords a market for certain explosive raw materials, including nitric acid, potassium nitrate, and glycerine.

Sulphuric acid, made by the superphosphate manufacturers and supplemented by that of other producers, supplies from 80 to 90 per cent. of the market requirements of this important industrial chemical. The absence of domestic resources of sodium chloride restricts the development of soda ash, salt cake, and other sodium chemical production in Sweden, despite the large demand for these industrial chemicals within the country. Imports of sodium sulphate amounted to 92,000 tons, while domestic output was reported at only 6,700 tons. Among other industrial chemicals manufactured in 1929 were 25,000 tons of aluminium compounds, chiefly aluminium sulphate, 800 tons of copper sulphate, 3,000 tons of glue, 860 tons of acetic acid, 1,400 tons of nitric acid, and 5,000 tons of hydrochloric acid.

### The Electro-Chemical Industry

Many of the industrial chemicals produced in Sweden are products of the electro-chemical industry. Production of calcium carbide, for use principally in the manufacture of calcium cyanamide, has declined in recent years, in line with the falling output of the latter product. Production of calcium carbide in 1926 was 43,000 tons, contrasted with 31,000 tons in 1929, with exports remaining fairly constant during the period at about 12,000 tons annually. Demand from the Swedish match, explosives, and pyro-technics industries resulted in the development of domestic potassium and sodium chlorate production, total output of chlorates increasing from 7,000 tons in 1926 to 10,000 tons in 1929.

Although manufacture of caustic potash and caustic soda is developing, Sweden stil imports around 3,000 tons of those alkalies, as wel as over 13,000 tons of chloride of lime. Other electro-chemicals produced on a small scale include phosphoric acid, and silicon carbide. The Swedish production of industrial gases is relatively important—particularly oxygen and acetylene. Carbon dioxide manufacture is increasing gradually and 1,244 tons were produced in 1929.

### Wood Distillation Products

The need for charcoal in ore reduction has allied the wood distillation industry to some degree with the large iron-ore producers who own large timber tracts which they exploit for wood pulp, charcoal, and other wood products. Though wood was distilled by primitive methods some years ago, modern retort methods have now gained a substantial footing. The products of the industry include charcoal, wood and pitch oils, methanol, acetate of lime, and turpentine. While the United States leads the market for rosin, consumed principally in the Swedish pulp, paper, paint, and soap industries, France supplies the bulk of the turpentine imported. American rosin sales account for 90 per cent. of the market requirements valued at over £110,000 annually.

About one-third of the methanol produced, which increased from 795 tons in 1926 to 1,115 tons in 1929, originates in the pulp mills. Wood tar is the most important wood distillate produced for export, shipments to foreign countries in 1929 having totalled 6,467 tons valued at £80,000.

Production of coal tar and related crudes occupies a comparatively unimportant place in Swedish chemical manufacture. There is only one coke oven, which, together with the municipal gas plants, accounts for the coal tar products made using imported coal. Coal tar production increased from 17,000 tons in 1926 to 23,400 tons in 1929. Output of asphalt and roofing tars was valued at £44,000, benzol at £40,000 and other tar products at £24,000 in 1929.

### Superphosphate Production

Sweden is a fairly important producer of superphosphates, although a minor producer of fixed nitrogen and nitrogenous fertilisers, and dependent upon Germany for its potash.

Superphosphate production which increased to almost 200,00 tons in 1930, offers a growing market for imported phosphate rock. The United States supplies at present about one-third of Swedish phosphate rock purchases, a large part of which enter the country through European transhipment ports. Exports of superphosphates represent annually about 15 per cent. of total production, shipments being made principally to Denmark and the Baltic States. Basic slag, totalling about 14,000 tons in 1929, was produced as a by-product in the manufacture of steel. Bone meal production has increased, from 4,000 tons in 1926 to 6,400 tons in 1929, of which approximately one-third is exported.

There is only one firm producing calcium cyanamide, the output of which has declined—from 37,000 tons in 1926 to between 15,000 and 20,000 tons during the past two years. By-product ammonium sulphate is produced by the only Swedish coke oven operator and by municipal gas plants—particularly those of Stockholm and Goteborg.

### Soap Manufacture

The manufacture of soap, a well mechanised industry, has been established more than a century. Present output, aggregating nearly 38,000 tons valued at £1,250,000, consists principally of soft soap valued at £560,000, toilet soap £390,000, and laundry soap and powder having a value of £230,000. Toilet preparations production is fairly well developed, the output of perfumes being valued at £93,000, and other toiletries at £440,000 in 1929.

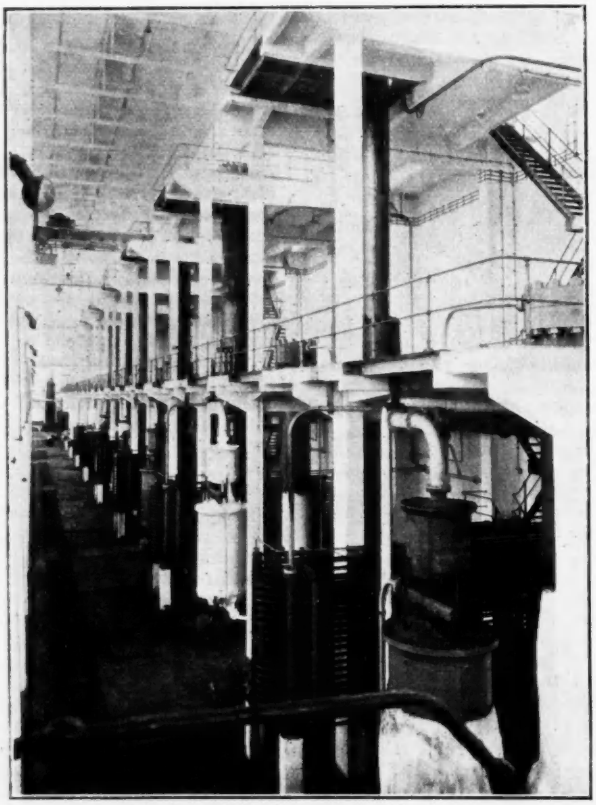
Another branch of the chemical industry is engaged in the manufacture of paints, lacquers and varnishes, to the value of some £770,000 annually, to which the United States contributes some raw material. A considerable domestic production of linseed oil—namely, 5,600 tons of raw and 6,850 tons of cooked—in 1929 furnished the Swedish paint industry with its chief vehicle for the production of paints.

# Heavy Chemical Manufacture in Holland

## The Works of the Compagnie Néerlandaise de l'Azote

THE Compagnie Néerlandaise de l'Azote, whose works at Sluiskil are here described, was founded in 1926, primarily as a means for utilising by-product gas from the adjacent coking works of the Association Co-operative Zélandaise de Carbonization, which disposes of its extensive coke production to the French metallurgical industry. The gas available from these ovens amounts to about 800,000 cu.m. per day, but since coking operations are not sufficiently constant, a water-gas plant has been introduced in order to sustain a constant supply.

The daily supply of coke oven gas mentioned necessitated the installation of four Linde liquefaction units, treating about 8,500 cu.m. of gas each hour. Each unit comprises a Schwartzkopf compressor (1,250 h.p.) handling 8,500 cu.m. per hour, a Sürth nitrogen compressor (900 h.p.) for 2,400 cu.m. per hour, a Sürth air compressor (750 h.p.) for 2,700 cu.m. per hour, and two Esslingen compressors for the benzol removal and for fractionation, and further equipment for washing gases, for debenzolisation, and for fractionation of the gases. The gas taken from the coke ovens is sent by centrifugal blowers to iron oxide purification chambers for sulphur removal; the clean gas is then collected in another holder, whence it is fed to the compressors. Further benzol removal is effected by refrigeration in ammonia towers. The removal of carbon dioxide from the air and from the combustion gases is effected in both cases by caustic soda, in the first under a compression of 3 kg., and in the second, after a system of water scrubbing, under 12 kg. compression. Excess nitrogen produced in the fractionating equipment is collected in another gasholder. Compressors, pumps, pump control boards, for fractionation as well as for synthesis, are assembled in a single building on an elevated floor, whilst motors are remote controlled, from a transverse passageway which affords a view on all operations. The hydrogen yield is 92 per cent. of that contained in the coke oven gas.



The Ammonia Synthesis Reaction Chambers.

For the synthesis of ammonia the Fauser process has been chosen, this plant representing the largest installation in operation. The economies realised by use of a pressure of 250 to 300 kg. for the reaction represents close to 25 per cent. saving in power as compared with similar operation under 600 to 800 atmospheres. In contrast with other low-pressure processes, this system uses an activated iron oxide catalyst, which has been found to require renewal once a year.

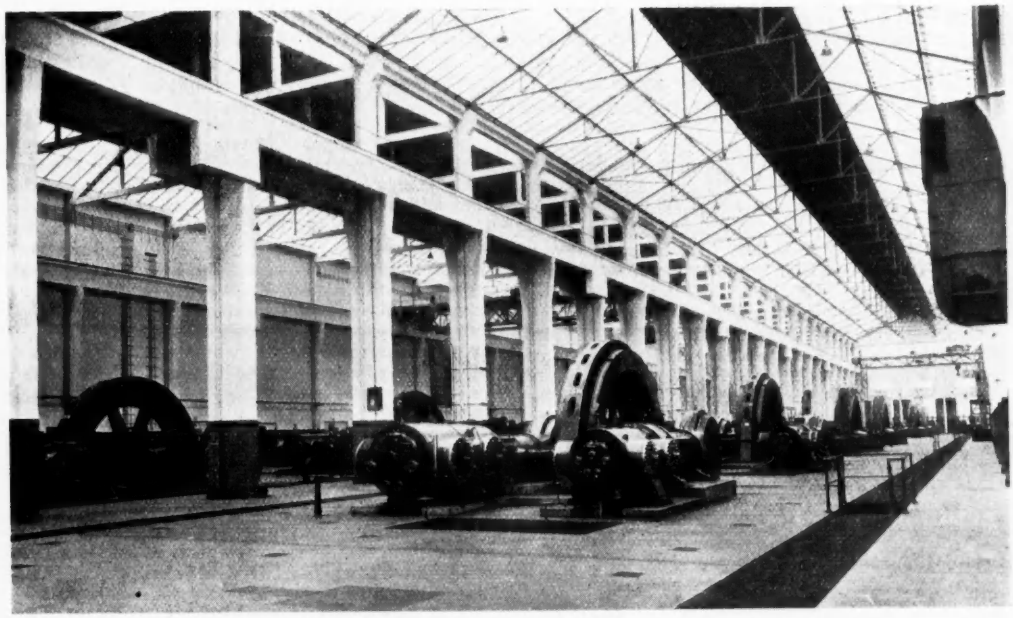
The synthesis plant comprises five compressors handling 6,000 cu.m. per hour, raising the pressure of the gaseous mixture from the Linde plant from 12 kg. to 250 kg.; two compressors handling 2,500 cu.m., six reaction towers, each producing 35 to 40 tons of ammonia a day; and two preliminary convertors, the total capacity of the plant being 200 tons of ammonia per 24 hours. The preliminary convertors transform any residual carbon monoxide into methane, which is not a catalyst poison. Every synthesis unit consists essentially of the reaction chamber proper, a water cooler, a column for condensation and separation of liquid ammonia, an ammonia evaporator and a circulating pump. Preliminary heating of the reaction chambers is produced by electrical resistances in the interior, but once reaction has started, the current is shut off.

The ammonia produced in the synthesis is consumed in ammonium sulphate manufacture, according to the Fauser process. In contrast to the ordinary processes in liquid medium, which give a moist and acid product necessitating further treatment for producing dry sulphate, this process operates in a dry phase, giving the product directly. This is marketed either in a powdered form as it is made or in granulated form by further treatment. The necessary equipment consists of steel reaction chambers in which the ammonia is introduced in the bottom and meets a shower of acid distributed through the top. The sulphate formed drops to the bottom of the chamber, where it is removed by a screw conveyor, while the vapours, consisting of water vapour and sometimes traces of ammonia or acid, pass an acid scrubbing system before returning to the reaction chambers. The installation can produce up to 800 tons of ammonium sulphate in 24 hours and includes storage facilities for 60,000 tons of material.

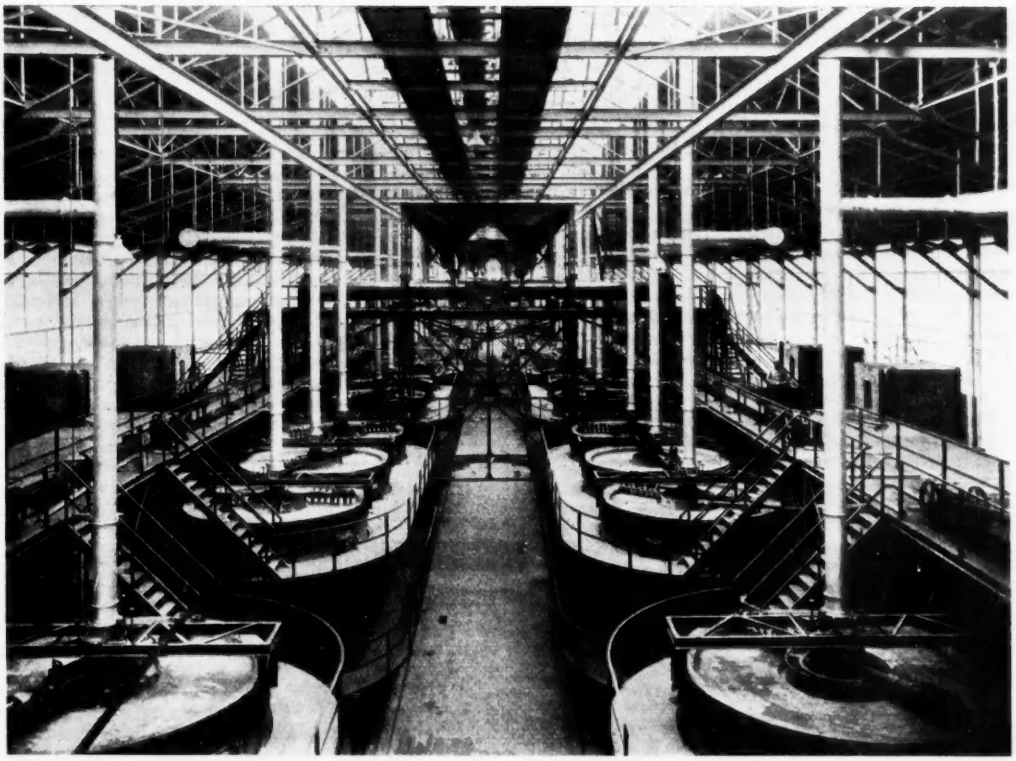
In order to obtain the acid necessary for the ammonium sulphate, a plant has been constructed to produce 640 tons of 60° Bé. acid per 24 hours. The building consists of a steel and brick structure 520 ft. long and 480 ft. wide. In a long central hall, the furnaces are set up in a double row; and in eight annexes (four wings on each side of the central hall) are the lead chambers. Two long passageways pass over the Glover and Gay-Lussac towers, separating the central hall on each side from the wings.

The plant consists of 16 units, each comprising three furnaces, one Glover tower, seven chambers totalling 3,150 cu.m., two Gay-Lussacs and numerous pumps and accessories. The large number of units is necessary to give the requisite flexibility due to fluctuating markets. The principal characteristics of the installation are the large Glover towers and the intensive chamber system. By the arrangement of the furnaces in a double row, the pyrites can be carried on a single conveyor running through the middle of the hall and feeding both sides. The cinders are discharged at the rear of the furnace and conveyed away by cars on an endless cable.

With a view to manufacturing nitrates, a plant has been constructed for the production of 120 tons of 36° nitric acid daily, consisting of a closed building in which are situated the ammonia oxidising chambers, several compressors and absorption cylinders. In the Fauser system employed here, absorption cylinders replace the customary towers filled with Raschig rings. The tanks are empty except for the nitric acid through which the gas bubbles for absorption. Because the tanks are cooled on the outside, the streams of acid flowing on the walls within are rapidly cooled, which favours both the oxidation and the absorption. They are arranged on a descending plane, the acid flowing down by gravity and the gas ascending counter-currently.



The Compressor House, where the pressure of the gaseous mixture from the Linde Plant is increased to 250 kg. The capacity of these compressors is 6,000 cu.m. per hour.



The Pyrites Burners serving the Sulphuric Acid Plant. This building is 520 ft. long and houses 16 units each comprising three furnaces and a chamber capacity of 3,150 cu.m.

## Heavy Chemical Manufacture in Holland.

*Reproduced by courtesy of the Compagnie Néerlandaise de l'Azote, Sluiskil.*

# Vulcanisation Accelerators for the Rubber Industry

## Some Derivatives of the Dithiocarbamate Group

*At the end of 1930 there were over one hundred vulcanisation accelerators commercially available. The following notes on a particular range of such products is based on information supplied by Robinson Brothers, Ltd., of Birmingham. Piperidine pentamethylene dithiocarbamate is claimed to have been the first really active accelerator to be employed in the rubber industry.*

CHEMICALLY pure piperidine is a colourless mobile liquid of strongly basic character boiling at 107° C. It fumes in the air owing to the formation of piperidine carbonate, and has a powerful ammoniacal odour. Piperidine, as such, is not a powerful accelerator, but it reacts with carbon disulphide to form the piperidine salt of pentamethylene dithiocarbamic acid (P.P.D.), which is one of the most active ultra-accelerator known. In certain processes it may be desirable to form the P.P.D. in situ; for example, piperidine may be incorporated in a mixing and the whole then exposed to the vapour of carbon disulphide; separate solutions in benzene or naphtha containing piperidine on the one hand and carbon disulphide and sulphur on the other may be mixed when required; alternatively, piperidine or other bases may be used in conjunction with a substance which generates carbon disulphide at a convenient vulcanising temperature. Such methods have been devised in order to overcome danger of "scorching," since the active P.P.D. is only formed after works processing has been accomplished.

### Piperidine Pentamethylene Dithiocarbamate

Piperidine pentamethylene dithiocarbamate is an almost colourless solid melting at 172° C., at which temperature dissociation also occurs. It is readily soluble in water, alcohol, acetone and coal tar benzole and naphtha. As an accelerator it is extremely active and can be used at temperatures varying from room temperature upwards; it is, however, specially suitable for short cures at low temperatures. In view of its activity at such low temperatures it is clearly necessary to take the usual precautions against scorching. So great have been the advances made in rubber technology during recent years that super-active accelerators such as P.P.D. are being used for many purposes where their applications was previously considered impossible; this is especially the case on the Continent.

It is quite common practice to spread alternately a solution containing the super-accelerator, such as P.P.D., rubber fillers, etc., and a solution containing sulphur and a proportion of rubber. Such proofings can then be cured by running over a long spreading chest or drum, in a hot air chamber or wrapped in steam. P.P.D. does not give rise to serious discolouration, but where the nature of the goods necessitates minimum discolouration or where the goods are cured in the open under such conditions that P.P.D. might be lost through volatilisation it may be preferable to employ zinc pentamethylene dithiocarbamate (Z.P.D.). Many active accelerators are practically useless for mixings containing fibres, cork, etc., and P.P.D., which is practically effective either with press or hot air cures, will be found to be very useful in many types of this work, in which there is no danger whatever of scorching. Except in cases where the cement is to be used within a very short time of preparation, it is necessary to keep the accelerator and sulphur separate in two solutions. While each manufacturer will adjust the quantities to suit has own particular needs, generally 0.5 to 1 part of P.P.D. with 5 to 7 parts of sulphur will be found suitable. Where blooming is to be avoided the proportion of accelerator should be increased and that of the sulphur decreased.

### Sulphur-Accelerator Ratio

With P.P.D. the ratio of sulphur to accelerator may be varied within wide limits according to the results desired. As little as 0.75 parts of sulphur in conjunction with as much as 1 part of P.P.D. gives good results; on the other hand, 2 parts of sulphur will give good results with as little as 0.25 parts and excellent results with 0.35 parts of P.P.D. In certain cases, according to the nature of the mixing, the amounts of sulphur and accelerator may be still further reduced. On the other hand, in different types of mixings it may be necessary to increase the quantities. With 1 part of P.P.D. and 0.75 parts of sulphur a full cure can be obtained in about 10 minutes at 115° C. (10 lb.); with 1.25 parts of sulphur this time is reduced to 6 minutes. With 2 parts of sulphur and 0.25 parts of P.P.D. a good cure is obtained in 9 minutes at 141° C. (40 lb.), and a very full cure with 0.35 parts of P.P.D. at the same temperature in 5 minutes. Using very low temperatures, such as room temperature, the amounts of sulphur and accelerator must be varied according as to whether the goods are to be blooming or non-blooming, and the time available. In a general way 2 to 4 parts of sulphur with 1 part of P.P.D. will be found suitable.

The best results with P.P.D. and other piperidine accelerators are always obtained in the presence of zinc oxide, and generally speaking 3 to 4 parts is sufficient. Occasionally better results are obtained with larger quantities of zinc oxide, and in such cases the amounts of accelerator and sulphur can be reduced still further. In mixings containing rubber with normal amounts of fatty acids addition of stearic acid is not necessary, but in a general way the addition of 0.25 parts of stearic acid may be regarded as a safety factor.

### Zinc Pentamethylene Dithiocarbamate

Although zinc pentamethylene dithiocarbamate (Z.P.D.) is insoluble in water, it can be used for hot water cures by making a suspension of the material in water. Chemically it is more stable than P.P.D., and its use is therefore indicated where long storage is anticipated. Similarly it has advantages, in view of its great stability, for work in tropical countries. Its critical temperature is rather higher than that of P.P.D., so that it may be preferred for certain types of cements, where there may be considerable exposure of surface of the goods before the self-curing operation takes place. For latex work or other work where loss of the somewhat volatile P.P.D. is liable to take place, or where discolouration is to be reduced to a minimum, Z.P.D. is to be preferred.

In mixings containing no special activating or retarding agents, 1 to 1.25 parts of sulphur with 1 part of Z.P.D. should give good results. With 2 parts of sulphur, 0.3 to 0.35 parts of accelerator give good results. In mixings containing large quantities of an activator, such as zinc oxide, both sulphur and accelerator can generally be reduced still further. In self-curing cements or other self-curing work, however, more accelerator is required and 1 to 2 parts of Z.P.D. with 2 to 4 parts of sulphur may be used according to circumstances and the nature of the cure desired. Like P.P.D., the zinc compound can be employed at practically any temperature from room temperature upwards. Using 0.5 parts of Z.P.D. with 3 parts of sulphur a sufficiency of zinc oxide and a little stearic acid, a good cure is obtained in about 10 minutes, a full cure in less than 15 minutes, and an optimum in about 20-25 minutes at 115° C. At 130° C. a good technical cure is reached in about 8 minutes and the optimum in about 12 minutes. At 141° C. curing is very rapid, a full technical cure being reached in less than 5 minutes and an optimum in between 5 and 6 minutes; at this temperature, using 1 part of Z.P.D. and 2 parts of sulphur, a good technical cure is reached in slightly under 7 minutes and the optimum in about 7 minutes.

### A Safety Ultra-Accelerator

Lead pentamethylene dithiocarbamate (L.P.D.) may be regarded as a safety ultra-accelerator with an almost unique combination of properties. It can be heated to a relatively high temperature in a rubber mix before it develops appreciable accelerating action, but when heated to its critical temperature it is exceedingly active, in fact, more so than Z.P.D. In this compound rubber manufacturers have at their disposal a very active accelerator, which under all reasonable conditions need give them no anxiety as to scorching, pre-curing or setting up during storage in stock. Mixes containing 1 part of L.P.D. and 2 parts of sulphur have been heated for prolonged periods at 100° C. without any material vulcanisation taking place. With 0.5 parts of L.P.D. and 3 parts

of sulphur, curing is quite slow at 115° C., the optimum being hardly reached after 50 minutes; at 130° C. a good technical cure is reached in a little over 10 minutes and the optimum in about 15 minutes; at 141° C. curing is very rapid, the optimum being reached in about 5 minutes.

Unlike certain other lead salts of strong accelerators, L.P.D. does not need any litharge for its activation, but if it be desired to use litharge about 3 parts will lower the critical temperature appreciably and increase the rate of cure. In a general way the addition of litharge is not recommended, but where mixings which contain litharge are in question, the activation of the litharge on the L.P.D. must be taken into consideration, as with Z.P.D. and P.P.D. some zinc oxide is required to develop the best results. L.P.D. is also remarkable since it does not cause general discolouration in the same way as does a mixture of P.P.D. and litharge. Excellent bright red inner tube mixings have been made using L.P.D. In very light coloured mixings, especially where the exact shade of colour is of importance, trial mixes should be made, since in certain classes of mixes a slight greying may occur.

### Influence of Mineral Fillers

Most mineral fillers can be used in mixings accelerated with L.P.D. without destroying or reducing the effect of the accelerator. There are, however, one or two ingredients such as light magnesium carbonate which tend to reduce the effectiveness of this accelerator slightly and the results obtained in the presence of colloidal clay are not particularly good. It has been found that in some cases greatly improved results can be obtained by using other accelerators in conjunction with L.P.D. In mixings of this type exceptionally high tensiles are obtained and the modulus is considerably improved.

When L.P.D. is used in conjunction with mercaptobenzothiazole, a distinct two-accelerator effect is noticeable. There is also an improvement in physical properties, and this applies not only to pure mixings, but also to those made with fillers of the type referred to above.

Cadmium pentamethylene dithiocarbamate (C.P.D.), above the critical point, is as active as Z.P.D., with a factor of safety almost equal to that of L.P.D. It has a big advantage over L.P.D. in certain mixes owing to the fact that it has no tendency to discolour the vulcanisate. At ordinary temperatures mixes show no signs of curing after many months. Pure mixes containing 0.25 parts C.P.D. and 2 parts sulphur show no signs of vulcanisation at 70° C., during a period of about eight hours; under the same conditions a comparable (non-safety) ultra-accelerator was fully cured in 4 to 5 hours. At 100° C. similar mixes may be heated up to one-and-a-half hours before vulcanisation becomes apparent. This compound is suitable for all purposes for which L.P.D. is used, but owing to its freedom from any tendency to discolour it is specially applicable for manufacture of light or bright coloured goods. It is suitable for rapid cures at medium or high temperatures and can be used in steam, press or hot air cures.

## Soda Ash Production in Japan

DURING 1931 both the Asahi Glass Manufacturing Co. and the Dainhon Kali K. K. increased production of soda ash so that the total for that year was 80,000 metric tons compared with 60,000 tons in 1930. It is now reported that the Asahi Glass Manufacturing Co. will produce some 60,000 tons during the current year and the Dainihon Kali K. K. will produce an equal amount making a total of 120,000 tons. The 1931 import figures for soda ash are not available. In 1930, there was a decline to 72,000 tons from 87,200 tons in 1929.

## Zinc Oxide in Czechoslovakia

IT is reported that a new plant for the production of zinc oxide has been placed in operation by the German firm, Guggenheimer and Co., at Podhor, near Prague. This concern, which has branch factories at Vienna and Belgrade, manufactures the pigment by a new cold process method which is claimed to be considerably cheaper than the usual furnace method. Prior to the world-war there were only two producers of zinc oxide in Czechoslovakia; with the advent of a new manufacturer competition has been strengthened, causing reduced prices.

# Chemical Import Trade in India

### Statistics for Past Nine Months

THE import trade of India during the first nine months of the fiscal year April 1 to December 31, 1931, is surveyed in a report just issued by the Department of Overseas Trade (Ref. C.3850), from which the following particulars relating to chemical products are abstracted.

As might be expected during a period of such intense industrial depression, trade in paints and colours fell from £468,750 to £360,000. United Kingdom shipments receded from £303,750 to £223,125, those from Germany from £56,250 to £43,125 and the United States from £26,250 to £16,875. Imports from Japan, however, rose slightly from £16,875 to £20,625. The share of all other countries dropped from £63,750 to £54,375.

Total imports of soap were again reduced from £639,375 to £513,750. The British share fell from £566,250 to £431,250, while that of the remaining countries advanced from £71,250 to £82,500.

Once again it is satisfactory to record merely a slight reduction in the trade in chemicals from £1,447,500 to £1,406,250. It is also satisfactory to note that the two items in which British manufacturers are mainly interested, namely, sodium carbonate and caustic soda, actually show increases. Total imports under various headings were as follows:—

| | 1930 | 1931 |
|---|---|---|
| | £ | £ |
| Acids ... ... ... ... | 56,250 | 39,375 |
| Bleaching powder ... ... | 41,250 | 54,375 |
| Carbide of calcium ... ... | 52,500 | 43,125 |
| Copper sulphate ... ... ... | 22,500 | 16,875 |
| Disinfectants ... ... ... | 54,375 | 43,125 |
| Glycerine ... ... ... ... | 15,000 | 15,000 |
| Potassium chlorate ... ... | 41,250 | 33,750 |
| Soda bicarbonate ... ... ... | 39,375 | 45,000 |
| Caustic soda ... ... ... | 153,750 | 181,875 |
| Sodium Carbonate ... ... | 330,000 | 345,000 |
| ,, cyanide ... ... ... | 20,625 | 20,625 |
| ,, silicate ... ... ... | 18,750 | 13,125 |
| Sulphur (brimstone) ... ... | 116,250 | 97,500 |

The trade in drugs and medicines advanced slightly from £1,029,375 to £1,044,375, the following being the principal items:—

| | 1930 | 1931 |
|---|---|---|
| | £ | £ |
| Camphor ... ... ... ... | 153,750 | 150,000 |
| Proprietary and patent medicines | 210,000 | 262,500 |
| Quinine salts ... ... ... | 120,000 | 135,000 |
| Saccharine ... ... ... ... | 5,625 | 11,250 |

In the section relating to dyestuffs the total imports of alizarine fell from 2,262,940 lb., valued at £85,000, to 2,175,232 lb., valued at £82,500. Imports from Germany dropped from 1,767,227 lb. (£65,625) to 1,719,270 lb. (£62,500), while those from the United Kingdom rose from 363,440 lb (£13,125) to 455,962 lb. (£18,750). The total imports of aniline advanced from 8,697,406 lb, valued at £941,250, to 9,058,631 lb, valued at £1,172,500. Shipments from the United Kingdom increased from 578,116 lb. (£60,000) to 774,575 lb. (£65,625), and those from Germany from 6,264,832 lb. (£665,625) to 6,920,104 lb. (£823,125). Arrivals from Switzerland increased from 319,802 lb. (£75,000) to 347,103 lb. (£76,875), while the share of the United States was reduced from 802,129 lb. (£75,000) to 628,363 lb. (£56,250) and that of Italy from 522,390 lb. (£45,000) to 246,676 lb. (£28,125).

## United States Methanol Output

UNITED States production of methanol during 1931 declined sharply. The refined wood distillation output of 1,718,826 gallons in 1931 declined about 64 per cent. compared to 4,858,755 gallons in 1930. Crude methanol fell to 3,235,113 gallons in 1931, considerably below the figure of 4,735,489 gallons in 1930 while synthetic methanol showed a smaller decrease to 7,007,332 gallons in 1931 from 7,589,227 gallons in 1930. Stocks of wood distillation refined methanol were lower on December 31, 1931, than at the end of any other month since September, 1928. Stocks of synthetic and crude methanol at the end of the year, however, still remained above the level of 1930.

# Some Chemical Aspects of the Electroplating Industry

By E. E. Halls

In many industrial concerns, no inspection is made of chemicals unless troubles arise in plating. Engineers appreciate the need for specifications to cover metals; for example, strict control for the absence of lead in heading brasses, and for its presence in free cutting grades, but to many of them chemicals exist in one grade only and the question of impurity does not arise. That the need for safeguarding against impurity is very important, is evident from the following analyses of three different bulk deliveries of zinc sulphate crystals. The first, despite colour, was employed without any appreciation of the significance of the latter and immediate trouble was encountered, revealing itself in dark stains on the zinc-plated product due to nickel impurity. The second contained iron impurity; this resulted in dirty plating solutions due to sludging, but quite a long period elapsed before the chemist was consulted to explain the difference between this material and the third, which worked satisfactorily. The expense of correcting solutions by filtration or "doctoring," and of refining work, cannot be ignored.

| | Sample No. 1. | Sample No. 2. | Sample No. 3. |
|---|---|---|---|
| Colour | Distinct pale green. | Slight brownish discolouration. | Dead white in bulk. |
| Zinc Content | 21.6 per cent. | 21.6 per cent. | 22.7 per cent. |
| Nickel | 0.20 per cent. | Nil | Nil |
| Iron | Traces | 0.18 per cent. | Nil |
| Other heavy metals. | Nil | Nil | Nil |
| Water Insoluble | 0.05 per cent. | 0.07 per cent. | 0.05 per cent. |

### De-greasing and Pickling

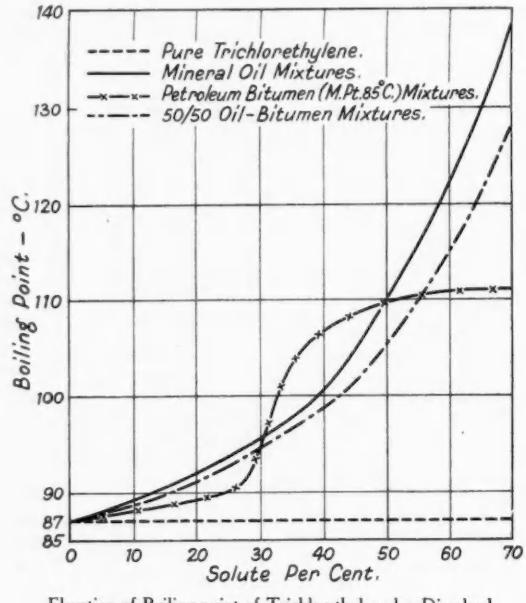
General surface preparation prior to plating at one time was broadly regarded as cleaning to remove grease, tarnish, etc., and to a more or less extent the same treatment was given to all components irrespective of the coatings to be applied or of their final functions. De-greasing is performed by one of two methods, by aqueous alkali solution or by solvent or solvent vapour. In the first case, caustic soda solutions of 5 to 10 per cent. strength are most commonly used, but they exhibit the disadvantages of being extremely difficult to remove from metal parts by subsequent washing, and of being rapidly contaminated by residual oils from previous machining operations. Tanks are usually run in pairs, one for removing the majority of the oil, and one for a final cleaning. When the first becomes exhausted, the sequence is reversed. In some shops, the de-greasing solution contains a mixture of alkali carbonates and silicate. This is more convenient to handle, and in addition to yielding an emulsification action, to some extent it seems to act mechanically, due to the silica constituent. Certainly for cleansing free from slight oiliness it is to be recommended. Alkali solutions are used hot, and very often the cleaning process is accelerated by electric current.

In a number of instances, oil is removed by rinsing with solvents such as white spirit or coal tar naphtha. More generally, trichlorethylene vapour is utilised in standard de-greasers, where efficiency claims chief technical consideration. The main cost is in expensive solvent, and satisfactory performance usually rests with maintaining the boiling point of the solvent as near that of the pure material, i.e., 87° C., as is practicable. As the content of dissolved matter increases, the boiling point rises, when (a) the cooling facilities may prove inadequate, with consequent loss of trichlorethylene into the atmosphere, or (b) the percentage of solute may reach a maximum and the heating facilities may be inadequate to effect boiling. A continuous redistillation system provides the best remedy for this condition; alternatively, the frequency of intermittent distillation must be controlled. In illustration of the diversity of effects that may be expected, results of laboratory experiments obtained from the distillation of various mixtures are shown in the appended diagram. The curves depict the boiling points of varying concentrations in trichlorethylene of (a) mineral lubricating oil, (b) straight-run petroleum bitumen, and (c) 50/50 mixtures of these. Where steam heating is relied upon, the limitations of any given steam pressure in effecting boiling can be foretold from such curves.

In acid pickling apart from the selection of a specific mixture, the use of an inhibitor is possible, at least with iron and steel, thereby effecting a saving in acid consumption and avoiding undue pitting. Temperature has also to be controlled if best results, without over dipping and excessive decomposition of acids are to be attained. Resort to sandblasting is generally decided upon on economic grounds; it is also applied prior to copper plating when subsequent enamelling is required. For heavily scaled parts it is to be recommended, also for high carbon steels, as pickling in the latter case is conducive to cracking. Where a chemist is employed he could ensure that heavily oiled parts are de-greased before sandblasting, and also that after this operation, a mild de-greasing is also employed, as there is a tendency for platers to pass work straight from blasting to plating baths.

### The Plating Process

Examination of plating solution formulæ give the impression that electro-deposition is of a complex nature and very different from the simple quantitative mechanism indicated by Faraday's laws. The latter indicate that a simple neutral salt solution under electric potential yields up its metal constituent at the cathode, replacement being theoretically




Elevation of Boiling point of Trichlorethylene by Dissolved Material,

looked after by the anode. While this may be true in the majority of cases in small-scale working, it does not hold good under commercial conditions where electro-plating is governed by an economic aspect as prime consideration. Rapidity of deposition is of utmost importance, at the same time maintaining consistency of product, that is, uniformity of appearance, good adherence and durability. As a result, simplicity of electrolyte disappears, and apart from the presence of a salt of the metal to be deposited, other ingredients are contained in it. One such ingredient is to increase the solubility of the principal metal salt, e.g., sodium cyanide in cadmium or zinc cyanide baths, these metal cyanides being otherwise practically insoluble. Another suppresses the dissociation of the principal metal salt, e.g., aluminium sulphate or sodium sulphate in zinc sulphate baths; zinc sulphate is readily soluble and ionisable, and coarse-grain deposits would result without this addition. A third increases conductivity of solution, e.g., sodium chloride in nickel solutions; a fourth assists anode dissolution, e.g. sulphuric acid in zinc sulphate baths; a fifth refines grain size, e.g. glucose or dextrine in

zinc and cadmium electrolytes, and a sixth ensures deposition of bright coatings, e.g., nickel chloride in cadmium baths.

A precise purpose is fulfilled by each ingredient, and to this end exact control has to be ensured not only in the initial make-up, but also in maintenance during working period.

Often a vat will run for several years before it is necessary to make up an entirely new solution; in the meantime by analytical tests for the main radicles, free acidity or alkalinity, and extraneous impurity and dirt, it must be maintained within very close limits of uniformity. Current density, aeration, filtration and solution temperature each call for close observance. Modern rapid plating with the aid of partly or wholly automatic plant, emphasises this need.

No better illustrations of the points stressed can be selected than those of two modern platings, viz, chromium and cadmium. In the former, the electrolytic solution contains chromic and sulphuric acids; the possibility of the latter building up, for example, owing to its presence as an impurity in chromic acid, and also excessive formation of tri-valent chromium compounds, demands constant supervision. Again, impurity, of which iron is the most easily acquired, has damaging results. A whiteness of milkiness that cannot be buffed out of bright chromium plate is not an infrequent source of trouble where these features are neglected. The second example, cadmium, represents a metal that is capable of rapid and easy deposition; cyanide solutions alone have been to any extant commercialised. Two features that develop into difficulties if not rigidly controlled are excessive solubility of the anodes and decomposition of cyanide. Thus, unless the necessary steps are taken, cadmium at first gradually builds up in the solution, and the sodium cyanide content gradually lowers; the fall in the latter ultimately causes cadmium to sludge out as an insoluble basic salt. Consequently, plating becomes variable and finally impossible.

The plating process, itself, cannot be passed over without reference to current density. Theoretically, a constant current is required to plate a given surface area to the same thickness of coating, but it will be readily appreciated that irregularity in the cathodic articles claims some adjustment of this current density to obviate excessive coarseness of the plating at prominences. At the same time, it is impossible to visualise the current density (that is, amperes per square decimetre of work surface) without prior knowledge of the approximate area of the articles to be plated, and in mass production actual area determination is vital as the variety of types handles makes guess work very misleading. In investigating the cause of wide difference in thickness of zinc on various components the writer found that it was esablished practice to employ 125 to 150 amperes per vat for a constant number of cathode hooks, independent of the work occupying these positions. The number of components per wire was controlled by piece-work rating, varying with size only in so far as affected spacing. Consequently, total area per load could, and actually did, vary widely, and the plating time being maintained roughly the same, 60 to 70 minutes, the probable cause of variation became apparent.

Water used for washing operations may vary with respect to solid content according to its source. For polished work, the problem of solid residue leaving whitish patches has to be considered, while for the easily stained platings like zinc and cadmium, the limit of chlorides permissible has to be established. Thus, varying results using the waters exemplified are not surprising. Final rinses in distilled water, although adding to cost, are often necessary, although air blast and controlled drying solve many difficulties.

# A Chemical Trade Ambassador in North America

## Comes to London to be Cheered Up

MR. G. W. WHITE, the manager of I.C.I. (New York), Ltd., has recently been in England on a business visit, and in the Imperial Chemical Industries magazine for April he gives an account of some of his activities in North America. I.C.I. (New York) differs from most of the company's organisations abroad in that that it is neither a selling nor a manufacturing company. It may be described as a highly specialised private commercial legation and Mr. White is, in effect, I.C.I.'s ambassador to North America. One of its main functions is to maintain friendly diplomatic relations with a large variety of American business concerns to provide for the necessary exchange of ideas.

This principle of exchanging scientific knowledge and commercial intelligence is in harmony with industrial rationalisation in its widest sense. Rationalisation's aim is the elimination of unnecessary effort, and if the great industries of the chief manufacturing countries can get together and share their accumulated knowledge both the industries themselves and their customers are bound to benefit substantially by the economies effected. The existence of the organisation in New York is evidence of the company's belief in the necessity for industrial co-operation on an international scale.

### A Group of Specialists

Of our job itself, said Mr. White, it is difficult to particularise. One has only to consider the extensive ramifications of I.C.I. to realise that the problems with which we have to deal on behalf of the company are concerned with a variety of branches of industry. We have to be ready to guide negotiations involving complicated technical matters; to deal with trading and market affairs; to report on chemical and engineering processes; to negotiate purchase or sale of patents; to organise a company; and, most important of all, to hold the I.C.I. fort in North America. The staff in New York takes the form of a small group of specialists, specially selected and trained, and an opportunity to join the staff or to spend some time in the organisation is prized for the valuable experience gained.

The directors of I.C.I. regard the New York organisation as the finger which they keep on the pulse of American trade and commerce. It is the line of communication; its job is to keep in touch, to see that no opportunity of opening up commercial relationships is overlooked, to make suitable arrangements for the access by I.C.I. to American technique and by American firms to I.C.I. technique.

Mr. White is a director of Canadian Industries, Ltd., which is one of the largest commercial concerns in the Dominion and has an organisation and works stretching from East to West. It carries on a number of operations similar to I.C.I. and its other associate company, E. I. du Pont de Nemours and Co.

Mr. White was particularly enthusiastic about the possibility of closer contact between Canada and Great Britain. Recent American tariffs have disturbed what was in effect a system of managed currency operating between Canadian and American business interests. Now is the great opportunity for Britain, said Mr. White. Canada, nearly 3,000 miles away, is turning to the old country. The job of our industries here is to find out what Canada wants, to realise that she has special needs and that goods must be got across quickly if they are to compete on level terms with other imports. If the forthcoming Imperial Conference at Ottawa fulfils expectations there is an excellent chance of improving our trade with the Dominions.

### Extreme Nationalisation

Speaking of conditions in North America as he left them a few weeks ago, Mr. White said that New York, when he left it, was in a state of extreme gloom, and it was a commonplace saying among Americans that one must go to London to be cheered up. The United States, in common with many other countries, is suffering from extreme nationalisation. The world causes of the depression are not well understood and the majority of the people feel that they will escape the worst effects if they cut themselves off from the rest of the world, living for themselves and creating their own standards. In times of acute international distress it is natural that the American people should cling to their old policy of no foreign entanglements. Intelligent opinion recognises that the United States have reached a stage in development which is new in the history of the country and which will require new methods both of action and thought.

# The World's Radium Industry

## New Ore Deposits Anticipate Extended Production

*In "Technische Blatter" of March 20 and 27, Dr. F. J. Weiss contributed an interesting article on the radium industry of the world, of which the following is an abstract.*

IMPULSE to discovery of radio-active materials was given through the observations of Becquerels that uranium compounds emitted invisible rays which would penetrate light-excluding paper and discharge a charged electroscope. It was on December 26, 1898, however, that Mme. Curie was able to announce that she and her husband had succeeded in finding in a barium sulphate precipitate derived from pitchblende, a new element which was several thousand times as radio-active as uranium. By the repeated crystallisation of a mixture of barium and radium chloride, in which the latter was the least soluble of the two, pure radium chloride was ultimately obtained; this was electrolysed, using a quicksilver cathode, and radium amalgam produced which, after distilling off the mercury at 500° C. in a hydrogen atmosphere, yielded a small quantity of pure radium metal.

With the establishment of the element radium and its salts, a basis was created for the further investigation of minerals which showed properties fore or less like pitchblende, and to the property of ray emission the term "radio-activity" was applied. Scientists, world-wide, eagerly took up the study of radio-activity; the former conceptions regarding the chemical elements, which had seemed to be unassailable, had to be abandoned. In place of the stable, indivisible and indestructible atoms, an extremely complex picture was introduced by the self-decomposition of the radium element releasing quantities of energy in the form of heat and rays, and also the transmission of the radium atoms into other elements. This discovery was responsible for the recognition of the electron as the smallest unit of electrical energy, as well as the quantum theory.

### Pioneer Work in Radium Recovery

When, in 1902, the production of radium and radium salts was commenced on a commercial basis, one milligram of radium was valued at 15 gold marks. Works were first established at Danne (Jil) and at Armet de l'Isle, and the mineral used as the source of the radium was autunite, obtained from Portugal and Madagascar. In Germany, radium recovery was taken up by the firm of Buchler and Co., Brunswick. These works, however, were together quite unable to satisfy the demand for radium by scientific institutions, and the price of the element rose steadily; in 1903 the price per milligram was 24 gold marks; in 1904, 23 marks; in 1905, 186 marks; and in 1906, 224 marks. The discovery of the therapeutic value of radium in incurable diseases, notably cancer, then increased the demand and in 1907 the price of a milligram rose to 466 marks. This led the Austrian Government to develop the production of radium from pitchblende found in the St. Joachimsthal mine in Bohemia, works being erected there in 1907, the operation of these works being continued after the war by the Government of Czechoslovakia.

In 1914, extensive carnotite deposits were discovered in Utah and Colorado, and although this mineral is poorer in radium than pitchblende, it was easier to mine and could be produced in relatively large quantities. In 1914 the production of radium from carnotite amounted to 22.4 grams; by 1920 the production had increased to 32.54 grams and in 1921 to 35.69 grams. In 1918, about half, and in 1922 about four-fifths, of the world production of radium was made in the United States. Other producers included the Radium Hill Co., in Sydney, and the Radium Extraction Co., in Adelaide, Australia. There was also production in Russia at State works at Elabuga. Of the total world production of radium reached by the middle of 1922, *i.e.*, 205.3 grams, 153.86 grams were produced in the United States, and only 22.47 grams in Czechoslovakia.

The high prices formerly attained for radium were not due alone to the scarcity of radium, but to the heavy cost of its extraction. When, in 1914, the United States entered as a new producer of radium with an output of about 10 times the former world production, the price began to decline. From 1916 to 1918 the average price per milligram was about 600 marks and in 1919 and 1920, only 480 marks.

In 1922 there was an important development in the radium industry by the opening in that year of the radium works of the Société Metallurgique de Hoboken at Oolen, in Belgium, which soon acquired a monopolistic position. The material treated in these works was obtained from the Belgian Congo through the Union Minière du Haut Katanga. In the concessions of this company, which is primarily a copper producing undertaking, radium bearing ore was discovered at Luiswishi in 1913 and at Chinkolobwe in 1915.

Although the Katanga ores are relatively rich in radium, the radium content amounts to not more than about 1 gram in 10,000 kg. of the mineral. The recovery of the radium from the ores ranges from about 80 to 90 per cent; a portion is unavoidably lost in the numerous operations necessary to isolate it. The process of extraction is roughly divided into three stages, the object of the first stage being the removal of most of the sterile material and the production of what is known as "crude sulphate." This stage is carried out in Africa; it consists of treating the finely crushed mineral with sulphuric acid which dissolves out uranium, iron, copper, and phosphoric acid. A concentrated sodium chloride solution and hypochloric acid is added by which the calcium is removed; the sulphates are also converted into chlorides, which results in a separation of silica. Finally, the chlorides are reconverted to sulphates to form the "crude sulphate" which is a mixture of barium and radium sulphates in the proportion of 125,000 to 1, with certain impurities. This material is shipped to Belgium for further treatment.

In the second stage, the cloridising of the crude sulphate and the elimination of impurities except barium is effected, 30 kg. of crude sulphate yielding about 6 kg. of crude chloride. The third and final stage is the production of pure radium salts, the crude mixed chlorides being subjected to repeated crystallisations in which the smaller solubility of the radium chloride is utilised to effect a separation. At first, the crystallisations are from solutions in distilled water, followed by crystallising from dilute hydrochloride solution, and finally, from a solution of hydrobromic acid to obtain radium bromide. In this way the radium is concentrated from an original dilution of the order of 0.05 per cent. to one of 98 per cent., which is the usual degree of purity for commercial preparations. Sometimes the bromide is converted into the sulphate, which is less soluble and thus more secure against loss. The dried radium salts are transferred to small glass tubes which are hermetically sealed, a platinum wire being fused into the glass to conduct away any positive electricity which may otherwise accumulate in the tubes.

The present productive capacity of the Oolen works is about 6 grams of radium monthly. At present, the price fluctuates between 60 and 70 dollars per milligram (£12 10s. to £15), or in the region of 270 marks.

### New Radium Deposits in Canada

Dr Weiss makes no reference in his article to the discovery of very important deposits of radio-active ore in the North West Territories of Canada. The extraction of radium from these deposits has not yet commenced but it is expected that works for this purpose will be completed in the present year. These deposits are on the shore of Great Bear Lake, about 800 miles distant from the nearest railway point at Waterways, and is on the Arctic Circle, but this fact is not considered to offer any special mining difficulties. The hand-dressed ore gives a product containing from 40 to 50 per cent. uranium oxide ($U_3O_8$) and it is calculated that about 8 tons of this dressed ore will yield one gram of radium. There are indications of the presence of pitchblende deposits at several places in the district and intensive prospecting in the coming summer is contemplated. It seems not unlikely that this source of radium will surpass in productivity the rich deposits in the Belgian Congo. The economic aspect of exploiting the Canadian pitchblende deposits is favoured by the fact that silver up to a maximum of 900 oz. to the ton is associated with the ore.

# Argentine Chemical Trade Conditions

## Increased Russian Competition

THE Department of Overseas Trade has issued a Report on Economic Conditions in the Argentine Republic, by Mr. Keith Jopson, commercial secretary at Beunos Aires, with an introduction by Mr. S. G. Irving, commercial counsellor (H. M. Stationery Office, price 4s. net). The report, which covers the period to October 31, 1931, states that the salient feature of Argentina's heavy chemical trade during the year under review was the substantial increase in the importation of chemicals from Soviet Russia, especially soda ash, caustic soda, sodium bicarbonate and sodium silicate. The majority of these consignments are still unsold, notwithstanding the abnormally low prices at which the goods have been offered, and although Russian competition has obviously been detrimental to the interests of British manufacturers, who have hitherto supplied the bulk of Argentina's requirements of the above products, it does not appear to have undermined the preference which consumers have invariably shown towards British alkali. The depressed condition of local manufacturing industries has been reflected in a reduced consumption of heavy chemicals, but this setback should be regarded as only temporary, since the steady development of local industry must be accompanied by an increase in the demand for chemicals. The import trade in salt has fallen away considerably, following a sharp rise in the import duties. There is no new activity to record in the local production of chemicals.

### Germany as Britain's Competitor

Germany remains Britain's greatest competitor in pharmaceutical drugs. Prices of German products are usually about 15 per cent. cheaper than those manufactured on a large scale in the United Kingdom. German manufacturers are now selling, at lower prices, several types of drugs which were formerly regarded as British specialities. The principal obstacle to the sale of British drugs appears to be their price, and until it is possible to reduce quotations to a more competitive level there is small prospect of substantial increases in sales. Important German firms maintain their own depots in Buenos Aires, and deal in pharmaceutical specialities on a large scale, as well as ordinary loose drugs. The consumption and sale of drugs by the wholesale druggists has fallen off latterly, owing to the increasing popularity of patent medicines and medicinal specialities of both Argentine and foreign origin.

### Dips for Animal Ailments

The remedies generally employed in the cure of scab, which is the chief disease prevalent amongst livestock in the Argentine, are arsenical powders and pastes, tobacco powder, fluid washes of poisonous and non-poisonous composition and to a lesser degree lime and sulphur. Most of these preparations are imported in large quantities from Great Britain, where the trade has become specialised as a result of close research into the origin and treatment of livestock ailments. The quantities imported from other countries are negligible. The dips which find favour in the Argentine Republic have been associated with this market, as a general rule, for many decades. Unknown brands of dip, though they may enjoy a good reputation in other parts of the world, find it exceptionally hard to obtain a footing in Argentina owing to the conservative nature of the farmer. Consumption of sheep and cattle dips during the year showed a tendency to diminish, owing to the fall in value of Argentine pastoral products. Where economy in production is a matter of urgency, the importance of suppressing scab sometimes receives secondary consideration. On the other hand, weather conditions and an abundance of pasture have warded off any serious outbreak of scab, with the result that the livestock survived the winter months in a satisfactory manner. Meanwhile the spread of cattle tick has been the subject of a special investigation by the Ministry of Agriculture. Locally-made fluids for treatment both of scab and cattle tick (Garrapata) are serious competitors of the imported article, particularly since Argentine exchange has been heavily depreciated. The highly competitive character of the trade, and the heavy exchange losses which have been sustained on all imports have combined to render the year under review one of the most difficult in the history of the trade.

One or two new brands of British origin have recently been introduced into this market, but there are no new developments to report in regard to foreign competition.

### Paints and Varnishes

The restriction of building operations, postponement of repainting work, depression in the motor car trade, the rigid economy practised by the railway and tramway companies, shipping Government and municipal departments and industry in general, are all factors which have combined to reduce the sale of paints, enamels and varnishes.

Comparatively few consumers take a real interest in the selection of their paints, otherwise there would be a far greater demand for higher class qualities to suit Argentine climatic conditions and thus to offer more lasting service. British manufacturers represented in Argentina should seize the present opportunity, in spite of the trade depression, to reinforce their propaganda and advertising, in order to be prepared to take advantage of the increased demand which should set in when conditions are more normal.

A British firm of considerable repute in Argentina is erecting a factory in Buenos Aires for the manufacture of its products, and another English company has purchased a large interest in a local factory already established.

By a recent decree of the Argentine Provisional Government, the customs valuation of paints in paste form not otherwise specified in the tariff has been increased from 4.76d. to 11.9d. per kilo plus 60 per cent. On this valuation a duty of 42 per cent. is now levied. This increase principally affects British trade, because, of a total import trade of 2,571 metric tons during the year 1930, no less than 1,720 metric tons were imported from the United Kingdom.

In varnishes, the import trade remains practically the same and is fairly well divided between British and United States manufacturers. Local production of varnishes has improved in quality, but is still inferior to the imported article.

# Corrosion-Resisting Plant for Acetic Acid

## Effect of Dissolved Air and Oxygen

NEW developments in acetic acid industries outlined in THE CHEMICAL AGE, March 19, page 252, are dependent on the use of more efficient processing and storage plant than that used hitherto. The fermentation and wood distillation industries have utilised copper and wooden tanks and barrels; while a new British concern dealing with large stocks of acetic acid of various concentrations has relied upon aluminium tank wagons and vessels for the pure acid, and wooden bats for dilute forms. British manufacturers utilising the acid will find much useful information upon this subject in a recent contribution by D. F. Othmer (*Chem. Met. Eng.*, March 1932). Wooden barrels, it is pointed out, should not be used for concentrations above 25 per cent. owing to shrinkage caused by stronger forms, while rubber-lined plant is also used for intermediate strengths. The vinegar industry has tried both these, in addition to brass, copper, nickel and various chrome-iron and chrome-nickel-iron alloys; and experience has proved the value of Monel metal and nickel, especially for withstanding the dilute acid and for use in heating tubes. High-chrome nickel steels have shown great resistance in the processing of hot vinegar, but Duriron is more effective as it is unaffected by acetic acid at any temperature or concentration even in presence of oxygen.

Dissolved air or oxygen in the acid causes the greatest corrosive effects; for example, vent-lines exposed to vapour of acetic acid plus air have had to be replaced in a short time, although not in contact with the acid itself. Aluminium is preferred to copper in this direction, since any traces dissolving do not colour the acid as copper does. Aluminium bronzes have also enjoyed favour, particularly for the plates of distilling columns, but traces of formic acid or of other acids present, for example, in pyroligneous acid are fatal to aluminium, and increase the general corrosive action to a high extent. Two ideal materials for special work are silver-plated copper and tantalum, and although of high cost, may yet prove their worth in special cases where all other materials are found to have a short life.

# New Technical Books

CHEMICAL ENGINEERING AND THERMODYNAMICS APPLIED TO THE CEMENT ROTARY KILN. By Geoffrey Martin. Crosby Lockwood and Son. Price £1 11s. 6d. net.

IN this book, which is intended for kiln designers, engineers and works managers, the complete theory of the rotary cement kiln has been worked out, based in the main upon thermodynamical calculation. With its aid we are able to calculate the correct clinker output from a rotary kiln of any given diameter—ranging from 1 ft. to 20 ft.—the theoretical outputs arrived at by thermodynamics being checked against actual practice. The sizes of the clinkering and decarbonating zones necessary for a given output can also be computed and checked against the actual yields of the kiln. There are also rules for finding the length, diameter and sizes of the various zones of both wet and dry process kilns, and masses of other data which will enable the works manager to learn whether or not the kiln is being worked at maximum capacity and economy. Engineers, too, should be able to design kilns with a high degree of certainty regarding the efficiency of their operation and output. Most of this information has been based upon researches carried out by the author while he was director of researches to the British Portland Cement Research Association, and it has not previously been published. It is to be regretted, however, that this excellent wealth of chemical engineering data has been paginated in a peculiar manner with the pages of each individual chapter starting at 1, for this seems to offer certain disadvantages in referring to the book.

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ARBEITEN UBER KALIDUNGUNG. O. Eckstein, A. Jacob and F. Alten. Landwirtschaftliche Bersuchsstation, Berlin—Lichterfelde, Berlin. Verlagsgesellschaft fur Ackerbau m.b.H. Pp 237. Price 6 R.Mk.

BEFORE the war research work in agricultural chemistry was largely confined to University Departments and Research Institutes in receipt of State Funds, but more recently the large fertiliser syndicates have realised that the limits to their sales are set by knowledge and experience available on the use of their products and they have been compelled to undertake research work. In this country Imperial Chemical Industries have an agricultural research station at Jealott's Hill, and in Germany there are agricultural research stations for fixed nitrogen, cyanamide, superphosphate, basic slag, lime and potash salts. The potash syndicate, however, was the first to publish a semi-technical journal, which is now in its twenty-eighth year, and it has been conducting research work in its central laboratories for many years. The new experiment station set up in 1929 in a suburb of Berlin and described in this volume is therefore an expansion and not an innovation. Some of the more original parts of this book have already appeared in other forms in scientific journals, but as now presented they are useful in setting out the methods and objectives of a specialised research station in a form interesting to the more general worker. The outstanding problem of soil chemistry is the adjustment of manuring to the composition of the soil and German workers attach great importance to the direct and empirical method of attack. Neubauer's method of determining the potassium and phosphorus taken up from the soil by rye seedlings under standard conditions and Niklas' more rapid method depending on the amount of growth of *Aspergillus* in a suspension of soil in citric acid receive much attention in the book. They give results of the same general order but there are many irregularities on comparing the two methods with each other and with field experience. Useful results are anticipated by expressing the amounts of potassium extracted by two salt solutions of different concentrations in terms of a special sorption equation. Problems in the mixing of fertilisers on the farm present questions which the laboratory worker would find difficult to answer offhand and the number of possible questions increases rapidly as new fertilisers come into use. Thus it might not be expected that a mixture of ammonium chloride and calcium carbonate would be sufficiently stable for farm use but the authors recommend it. Second order fertiliser effects such as those due to the magnesium, sodium and chloride in crude potash salts and the effects of potash fertilisers on the quality and composition of crops are also becoming more important.

SULPHUR BACTERIA. By David Ellis, pp. 261. Longmans Green and Co. 21s. net.

THE study of sulphur bacteria supplies matters of interest not only to the bacteriologist, but also to the chemist who is interested in the analysis of water, in the preservation of the purity of water reservoirs, and in the chemical changes which take place in sewage-laden waters. The researches on these organisms are spread over a wide field of investigators, but here an attempt is made to present to English readers for the first time a survey of the present position of our knowledge upon this subject. The term "sulphur bacteria" is applied to those members of this group of organisms which have sulphur globules in their cells.

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CHEMISTRY AT THE CENTENARY MEETING OF THE BRITISH ASSOCIATION, pp. 272. W. Heffer and Sons, Ltd., 7s. 6d. net.

THIS volume is the only complete record of the proceedings of the Chemistry Section of the British Association at its centenary meeting in September, 1931. It includes:—(1) Sir Harold Hartley's presidential address on "Michael Faraday and the Theory of Electrolytic Conduction"; (2) the discussion on the Influence of the Medium on the Properties of Electrolytes; (3) the discussion on the Chemistry of the Vitamins and Related Substances; (4) the symposium on the British Fuel Problem; (5) the discussion on the Structure of Simple Molecules, and (6) an account of the exhibits and the excursion to the Gas Light and Coke Company. The volume, therefore, contains material which is nowhere else available regarding the latest progress in very important fields of research in which advances are being made at the present time. The Organising Committee of the Chemistry Section undertook the publication of this book in order to give a distinctive character to the centenary meeting, and on this committee falls the responsibility for the finances of the venture. The price of 5s. announced in October for subscription copies proved inadequate owing to the fact that the proceedings were reported in far greater detail than was anticipated, and they have resulted in a much larger volume than was expected. The subscription price has therefore been withdrawn and the published price fixed at 7s. 6d. net.

# Soap, Candle and Perfumery Trades

### Statistics from the Census of Production, 1930

A SMALL increase in net output value is shown in the Preliminary Report of the Fourth Census of Production in respect of the soap, candle and perfumery trades, the aggregate figures being as follows:—

| | 1930. | 1924. |
|---|---|---|
| Gross value of output | £28,074,000 | £31,914,000 |
| Cost of materials, etc. | £15,531,000 | £19,626,000 |
| Net output value | £12,543,000 | £12,288,000 |
| Number of employees | 25,840 | 28,909 |
| Net output per head | £485 | £425 |

Production of soap of all kinds showed no noteworthy change in volume in 1930, but there were decreases of about 12 per cent. in the output of hard soap (excluding toilet, shaving and abrasive) and of nearly 10 per cent. in that of toilet soap. The output of shaving soap in 1930 showed an increase of about 58 per cent., and that of "other kinds" (which included powder and dry soap in 1924) an increase of over 47 per cent. It would appear that flake soap may have replaced hard soap to some extent.

No satisfactory measurement of the volume of production of the articles included in the category of "perfumery, cosmetics and toilet requisites" is available, but the returns showed an aggregate value of £3,478,000 for 1930, compared with £2,012,000 for 1924, an increase of over 70 per cent. in value and possibly more in quantity.

The quantity of glycerine entered on the returns amounted to 413,600 cwt., of a value of £669,000, as compared with 425,300 cwt., valued at £1,283,000 in 1924. These figures represent only the quantities sold by the manufacturers (or added to stock at the end of the year), *i.e.*, while they include glycerine sold after distilling they exclude that further used in the works in which it was made. The total quantity of crude glycerine manufactured in 1930 was shown at 392,500 cwt., and in 1924 as 445,000 cwt., a decline of 12 per cent.

# Forest Products Research

### The Use of Preservatives

THE Annual Report for 1930 of the Forest Products Research Board of the Department of Scientific and Industrial Research (H.M. Stationery Office, 4s. net.) draws attention to the desirability of a more rigorous definition of the term "properly seasoned" timber. Hitherto, the report states, the general method of seasoning sawn timber has been to stack it in open piles in the yard or shed for some considerable time before bringing it into use. The degree of seasoning is commonly expressed by stating the minimum time the timber has been stored. This, it is pointed out, takes no account of the time of the year at which seasoning begins, local climatic conditions or the variation in these conditions from the normal, the initial moisture content of the wood, the method of piling or the protection afforded to the timber. The report accordingly recommends that the haphazard specification of the degree of seasoning should be abandoned and replaced by more precise determination of the actual moisture content.

The report records a considerable amount of important work on wood-destroying beetles and fungi. Preliminary experiments have been made in the use of X-rays to detect insects in wood. The experiments have revealed in some cases quite small larvæ in wood half an inch thick which would not otherwise have been found without breaking the wood into fragments. To investigate and suggest means of checking the damage done by *Lyctus* powder-post beetles in the hardwood section of the trade, a survey has been made of all the important timber centres in the country. The general interest of the trade in this matter has been aroused, and in a number of cases manufacturers and merchants are known to be applying successfully the methods suggested for sterilising the timber and restricting the spread of the *Lyctus* beetle.

### Empire Timbers

The report draws attention to the speedy progress of the work on Empire timbers being carried out by the Department with the financial support of the Empire Marketing Board. With the co-operation of the Imperial Institute, collections containing nearly 1,000 specimens of Empire timbers have been formed at the Forest Products Research Laboratory and at the Institute. Duplicate sets of many of the specimens have been distributed to other Institutions interested in Empire timbers. Rhodesian M'gongo, a timber rather like balsa wood though inferior in several of its properties, was found to have a low thermal diffusivity which should make it valuable for use in places where variations of temperature occur. Abura wood from Nigeria was found to have very satisfactory acid-resisting properties.

The report describes how the defect known as "collapse," that is severe shrinkage, met with in certain timbers can be removed by a simple reconditioning process of warming the timber to 210° F. for four hours and then rapidly cooling it. In this way a commercial consignment of Tasmanian oak which had become very wet during shipment was transformed from a collection of ill-assorted and misshapen pieces into a pile of average juality. This successful result should have considerable commercial importance since according to the report "collapse" was so general as to threaten the trade in Tasmanian oak with extinction.

### Treatment of Railway Sleepers

Owing to difficulties experienced in impregnating British Columbia douglas fir with preservatives, railway sleepers of this timber have in the past been found to have a life of only 8 to 10 years instead of the 20 year life usually obtained with the creosoted Baltic timber. It was generally held that only 3½ lb. per cu. ft. of creosote, an amount insufficient for properly protecting the timber, could be absorbed by the British Columbia timber as opposed to 10 lb. by the Baltic timber. The report shows, however, that by first incising the sleepers by rows of staggered knives the full 10 lb. or over can be injected. The British Columbia timber can thus be fully protected.

## French Anthraquinone Imports Increase

FRENCH imports of anthraquinone during the first ten months of 1931 increased to 287,000 lb. compared to 199,000 lb. in the corresponding 1930 period.

# Chemical Trade in South Africa

### Effect of Dumping Duties

THE most important recent development in the South African chemical trade is the imposition of dumping duties on goods from countries which are no longer on the gold standard, and among the scheduled articles are various tinned and bottled foodstuffs, fruits, jams, jellies, sugar and sugar substitutes. All vegetable and animal oils, with the exception of cod liver oil, are included, and so are paints and colours, with the exception of artists' colours and dry pigments. The schedule also specifies furniture, leather, metal and similar polishes; soap; sheep and vegetable tallow; beeswax and other waxes; lead acetate; distilled glycerine; lead nitrate; sodium carbonate, including soda crystals (washing soda); and solid sodium arsenite.

South Africa's adherence to the gold standard is having a serious effect on the crayfish canning industry. Owing to the difficulties of the exchange, South African canners recently lost a £400,000 contract, and the whole industry is likely to suffer a decline until world conditions improve. This industry employs about 3,000 boats and gives employment to several thousand men. An important advance contemplated is the introduction of glass containers with enamel covered lids in place of the tins used at present. South African canners seem to feel that with this improvement they will control the world market.

### Maize By-Products

Maize by-products are still engaging the attention of the enterprising in South Africa, and two Pretoria men are now eager to open a factory in Bethal, Transvaal. They have secured options on the supply of cobs from farmers for the next five years, with the right of renewal for a further five years. The promoters are looking for a site on the railway line, and, once they have their factory in order, expect to produce fertiliser in addition to the other manufactures.

The Government Mining Engineer in Portuguese East Africa is trying to influence his Government to replace the importation of petrol by spirit manufactured locally from molasses. At the Buzi Estates near Beira spirit is being produced for private use at the rate of 2d. per litre, one litre of motor spirit being obtained from five kilos of waste molasses. When the motor spirit is produced from cane, the cost per litre is only 3d. Cars and motor lorries on the estates have been run on this spirit for a considerable period, and have given satisfactory service. Usually 9 per cent. of benzine is added to the spirit, which is known locally as "buziline." In a comparative test it was found that for every 26 litres petrol gave 100 kilometres, but at least 31 litres of "buziline" were required to accomplish the same distance. Thus, although consumption is 19 per cent. higher, the cost is still very much lower.

### Phosphatic Fertilisers

South Africa is not without phosphate deposits, but until recently she has had to depend upon phosphates from North Africa for manufacturing most of her fertilisers. Of recent years an extensive deposit of high-grade phosphate has been discovered in the Northern Transvaal, in the Palabora region, and this is likely to alter conditions in the local fertiliser trade. A large part of this field will be worked by the South African Phosphates, Ltd., which has been registered in Pretoria with a capital of £54,156 divided into 10s. shares. Although the fertilisers are to be much the same as those manufactured by other South African companies and the imported products, they are to be retailed at a much lower price than artificial compounds including phosphates from Northern Africa, America and elsewhere.

South Africa's largest fertiliser factory is at Umbogintwini, in Natal, and recently further extensions were made to the plant. The mixing and storage shed has been increased to over 700 feet in length and the annual capacity of the superphosphate plant raised to 70,000 tons, which is additional to the plant previously in service, the capacity of which was 45,000 tons a year. This factory, with those associated with it, is capable of satisfying all South Africa's needs, but in spite of this the importation of fertiliser goes on.

# Indian Chemical Notes

(FROM OUR INDIAN CORRESPONDENT.)

### Assembly Salt Committee's Recommendations

Whatever the *Statesman's* complaint may be, the Assembly Salt Committee last year strongly recommended that the investigation of the possibility of the development of other sources of supply in India, for example, in Bengal, and Bihar and Orissa and generally on the East Coast, should be undertaken immediately including possibly actual experiments on suitable methods of manufacture. They earmarked the money collected from additional import duty on salt primarily for the establishment of a supply of salt at a stabilised and fair level to Indian consumers, and thereafter for the development of internal sources of salt in Northern India, Bengal, and Bihar and Orissa. For Bengal, two experimental factories are suggested at Lothian Island in the Sunderbans and at Chittagong. For Orissa, a suitable site appears to be at the junction of Belasore and Cuttack districts, 20 miles from Balasore. Mr. Pitt's views on salt manufacture on Orrissa coast are helpful. At present Ganjam salt is consumed in Orissa and with the opening of the Parvatipur-Raipur Railway this salt would be diverted to the Central Provinces.

### Bengal Salt Prices

The *Statesman*, published in Calcutta, brings to light how the import duty on salt has only affected the consumer without promoting the Indian industry. When the tax began to operate, Aden salt was selling at Rs.40 to Rs.42 per 100 maunds. The price since has been from Rs.64 to Rs. 66 per 100 maunds—a net increase of Rs.24 which the consumer has paid. Aden salt does not pay import duty, but an increase in price represents almost exactly the tax that it would have paid had it been foreign salt. Half the quantity of Indian salt has also risen in price by Rs.24, the remainder, of a coarser variety, by about Rs.15. When the proposal of an import duty on salt was being discussed in the Assembly, it was assumed that the chief benefits would go to Bombay and Karachi works. What has actually happened is that salt from Aden to India has increased by about 2,700,000 maunds during the nine months from April, 1931, to December, 1931.

### Mining in Madras

The mining industry in Madras has shown a slight decline. The output of magnesite decreased from 22,000 tons to 15,500 tons. Out of the five kilns in Suramangalam only one worked during the year. The production was lowest for some years past. America, the chief market, obtains her supply to a larger extent from the nearer suppliers, the Grecian and Californian mines, and the Indian magnesite trade is greatly affected by this competition. The production of mica increased owing to the growing demand in the electrical industry. Barytes production also increased owing to the increased demand from the Calcutta Paint Works.

### New Use for Sulphate of Iron

The results of comparative experiments carried out on certain tea estates with a 2½ per cent. sulphate of iron solution as against a 3 per cent. formalin solution used as a fungicide, has shown that the sulphate of iron treatment has slightly better results than the formalin treatment. Moreover the bulk of the germination of the seeds treated with sulphate of iron was much more rapid than that of the seed treated with formalin. Thus, since sulphate of iron is cheaper than formalin and gives better results, sulphate of iron has now been strongly recommended for use on tea estates by the general manager of the Planters' Association.

## Fertilisers in Austria

CONSUMPTION of fertilisers in Austria declined considerably in 1930 as compared with 1929. Superphosphate consumption fell from 46,000 to 26,000 metric tons and the total decline for all chemical fertilisers was placed at 40 per cent. A large share of the domestic consumption represents imports from Germany. The Skoda-Wetzler Corporation, a leading factor in the Austrian chemical industry, produces superphosphate and also operates plants with a capacity of 30,000 tons of ammonium sulphate annually for recovery of the ammonia by-product of the municipal gas works.

# The Iron and Steel Institute

### Annual Meeting Arrangements

PARTICULARS have been issued of the annual meeting of the Iron and Steel Institute, to be held at the Institution of Civil Engineers, Great George Street, Westminster, on May 5 and 6. The meeting will commence each day at 10 a.m., and the formal business on the opening day will be followed by the presentation of the Bessemer Gold Medal to Professor Henry Louis. Fourteen papers have been submitted for presentation at the meeting, one of which has been postponed at the request of the author. The remaining thirteen are as follows: "Fourth Report on the Heterogeneity of Steel Ingots," by a joint Committee of the Iron and Steel Institute and the National Federation of Iron and Steel Manufacturers; "The Action of Sea-Water on Mild Steel," by G. D. Bengough and A. R. Lee; "The Lattice Spacings of Iron-Aluminium Alloys," by A. J. Bradley and A. H. Jay; "Blast-Furnace Engineering," by W. R. Brown; "The Properties of some Silico-Manganese Steels," by G. Burns; "The Austenite Pearlite Inversion," by Sir R. C. H. Carpenter, F.R.S., and J. M. Robertson; "The Theory and Practice of Nitrogen Case-Hardening," by A. Fry; "Some Experiments on the Nitrogen Hardening of Cast Iron," by J. E. Hurst; "The Heterogeneity of a Sand-Cast Steel Ingot," by A. Kriz; "The Determination of the Porosity of Tin Coatings on Steel," by D. J. Macnaughtan, S. G. Clarke and J. C. Prytherch; "Behaviour of Manganese in the Acid Open-Hearth Process," by E. Maurer and W. Bischof; "The Influence of the More Common Elements in Inhibiting Needles in Nitrogen-Rich Steels and Arc Welds," by L. W. Schuster; "Recent Improvements in the Greenawalt Sintering Apparatus," by J. Tornblad.

The annual dinner will be held at the Connaught Rooms, Great Queen Street, on May 5.

Preliminary announcement is also made of the autumn meeting of the Institute, which will be held in London on September 13, 14 and 15. This meeting will be held concurrently with that of the Institute of Metals, and it has been provisionally decided that at least one joint session shall be held at which papers of interest to members of both Institutes shall be presented and discussed.

## Research at Mellon Institute

### Progress During the Year 1931-32

ACCORDING to the nineteenth annual report of the director, Dr. E. R. Weidlein, to the trustees of Mellon Institute of Industrial Research, Pittsburgh, the sum of $722,541 (£148,700 at par) was received by the institution from industrial fellowship donors during the fiscal year ended February 29, 1932. The total amount of money appropriated by donors to the Institute for the past 21 years was $8,277,018 (£1,700,000 at par) all of which was expended in defraying the cost of scientific investigations conducted for these companies and associations. Throughout the year covered by the report 75 industrial fellowships, employing 170 scientists and engineers, were in operation. At the close of the year 58 fellowships were active, and of these 28 have been at work for 5 years and 13 for 10 years.

In reviewing the progress that has been made since 1911, when the Industrial fellowship system was established at the University of Pittsburgh, Dr. Weidlein points out that Mellon Institute has had fellowships on 230 distinct subjects, on which 775 scientists and engineers have been engaged. In all during the period 1911-1932, 313 fellows and 357 fellowship assistants of the Institute have completed their services to science and technology in the institution and have entered the fields of industry and education. As trained additions to the forces of manufacturing and teaching, these men constitute the Institute's greatest contribution to humanity.

The fellowship achievements of 1931-32 are summarised in the report, special attention being given to the research advances made by the Air Pollution Investigation, the Multiple Fellowship on By-Product Coke, the Iodine Investigation, the Organic Synthesis Fellowship, the Petroleum Production Fellowship, the Protected Metals Fellowship, the Steel Fellowship, the Sugar Investigation and the Fur Fellowship. The activities of the institute's Department of Research in Pure Chemistry are also described.

## Non-Machinery Accidents

### Safety First in Industry

AT a meeting arranged by the London Industrial Committee of the National "Safety First" Association, held at the Institution of Mechanical Engineers, on April 11, Mr. Leonard Ward, H.M. Senior Engineering Inspector of Factories, gave an address on "Non-Machinery Accidents." Mr. A. Ronca, chairman of the London Industrial Committee, presided. The lecture dealt with the common causes of many accidents under different causation groups and means for their prevention, and was illustrated by lantern slides.

Among matters dealt with were:—Reportability and record of accidents, movement of vehicles, explosions and fire, gassing and moltern metal, use of hand tools, persons struck by falling articles, falls of persons, persons stepping on or striking against objects and handling or carrying goods.

Mr. Ward pointed out that nearly all explosions started from a very simple cause. The danger, which was becoming more and more common, was in connection with the repair of motor car petrol tanks. Quite a number of people, he said, had been killed or seriously injured in attempting to repair them.

## I.C.I. Products in Building Construction

### Unique Display at R.I.B.A. Exhibition

IMPERIAL CHEMICAL INDUSTRIES, LTD., are organising a display of some of their products having a special interest to architects, builders and contractors, in connection with the exhibition of competition drawings for the new Royal Institute of British Architects building. This display will be opened in Thames House, Millbank, early next month. It will be arranged so as to indicate the application of each of the products concerned. For example, a rest-room for visitors to the exhibition will be provided by I.C.I. Metals, Ltd., showing the use of non-ferrous metals in domestic architecture. In a similar way there will be shown the uses of the "Pioneer" anhydrite blocks and plasters which are new products of the Billingham works and which are made from raw materials obtained on the site of this factory. Particular prominence will also be given to Rexine leathercloth and Stipplex leathercloth, as well as paints and varnishes for internal and external application. The latter are products of Nobel Chemical Finishes, Ltd. Of still wider interest, especially in view of future developments, will be the display of interior fittings and furnishing in moulded plastics. These will be representative of the whole plastics industry, this section of the exhibits having been organised by the British Plastic Moulding Trade Association.

## Japanese Fertiliser Imports

### A General Decline

FOREIGN fertilisers imported into Japan during 1931 amounted to 1,984,000 tons, worth £8,350,000, showing a 6 per cent. decline in value from 1930, according to the Japan Fertiliser Association. The great decrease of demand for fertiliser in rural communities following the economic slump and the drop of prices account for the unfavourable business. Soya bean cake, as usual, led the list of imports and ammonium sulphate was second. Details of import amounts and values for 1931, as compared with 1930, are as follows:—

| | 1931 Tons. | 1930 Tons. |
|---|---|---|
| Soya bean cake ... ... ... | 1,032,000 | 899,000 |
| Ammonium sulphate ... ... | 224,000 | 303,000 |
| Potassium chloride ... ... | 28,000 | 23,000 |
| Potassium sulphate ... ... | 38,000 | 67,000 |
| Phosphatic ores ... ... ... | 412,000 | 570,000 |
| Chilean saltpeter ... ... | 34,000 | 28,000 |
| Dust bone ... ... ... | 37,000 | 30,000 |
| Cottonseed cake ... ... ... | 64,000 | 82,000 |
| Rapeseed cake ... ... ... | 54,000 | 48,000 |
| Other cakes ... ... ... | 27,000 | 15,000 |
| Other fertilisers ... ... ... | 27,000 | 55,000 |
| Total ... ... ... ... | 1,984,000 | 2,118,000 |

Ammonium sulphate imported last year amounted to 224,000 tons, declining about 80,000 tons from 1930. This is caused by the great increase in the production of this fertiliser in Japan, which suddenly advanced from 350,000 tons for 1930 to 600,000 tons for 1931.

## German-Polish Potash Pact

### Government Approval

ON March 17, the Polish Government approved a commercial agreement between German and Polish potash producers. The agreement is for five years and by its terms the Polish organisation "Test" (Society for the Exploitation of Potassium Salts) will receive a quota of 4 per cent. in the world market which is now dominated by the Franco-German interests. The German Potash Syndicate will control Polish production but will relinquish competition on the Polish market. Poland was formerly one of the best export markets for German potash ranking after the United States and Netherlands. In order to encourage the domestic industry Poland placed a tariff on potash imports and as a result German sales on the Polish market fell from over 100,000 metric tons in 1929 to less than 2,000 tons in 1931. It is said that the tariff forced the Polish agriculturists to purchase unrefined domestic salts in place of the concentrated refined products to which they were accustomed. While the possibility of a loan to the Polish industry by the German syndicate was discussed it appears that the sales agreement does not provide for any financial assistance to the Polish industry.

## High Pressure Research at Ottawa

### New Laboratories

IT is the intention of the National Research Council to establish adequate facilities for high-pressure research in its new laboratories in Ottawa as soon as conditions permit. This announcement was made by Dr. G. S. Whitby, director of the Division of Chemistry, in the course of a recent address to the Ottawa Branch of the Engineering Institute of Canada. Showing how high-pressure synthesis of ammonia enabled Germany to produce explosives after the Chile nitrate was no longer available, Dr. Whitby described the evolution at Trail, B.C., where the sulphur fumes which had been a nuisance, and a costly one at that, are now being used in the manufacture of fertilisers. At the University of Alberta it has been shown that by hydrogenation under pressure the bitumen in the Athabasca sands can be converted almost completely into gasoline. The possibilities in this field of high-pressure industrial chemistry are enormous, but Canada has so far done little in the way of original research along these lines. It is with a view of stimulating such work that the National Research Council plans the establishment of a high-pressure research laboratory as soon as possible.

## Use of Gas in Industry

### Record number of Installations at Newcastle

THE Year Book of the Newcastle and Gateshead Gas Company for 1932 announces that, despite the depression, the number of gas burning industrial appliances installed in 1931 was greater than in any previous year. The company offers special reduced rates for industry, and amongst the installations during the year were two large furnaces for transforming zinc into zinc oxide, a set of vats for treating 450,000 gal. of varnish per annum, a six-ton plant for oil blending, a three-ton plant for gum cooking and a 50-ton plant for glucose reconditioning. Two of the year's installations consume each over 40,000,000 cub. ft. of gas per annum.

The company's industrial department, with its well equipped laboratory, assisted manufacturers during the year to a considerable extent. Problems relating to metallurgical processes, the science of combustion and every change of industrial conditions are the daily work of the staff. In the north-east district a co-operative arrangement has been made whereby the Newcastle Gas Company, when desired, assists other gas undertakings in the district in dealing with industrial heat problems.

Crude tar is transferred from the gasworks and distilled at the company's by-product works at St. Anthonys-on-Tyne, care being taken in the manufacture of refined tar for road work to meet the varied requirements of users. Benzol, naphthas, carbolic and cresylic acids, naphthalene, pyridine, pitch, etc., are also made available for home and export markets. Considerable export trade for the Tyne is provided by the company by the shipment of gas coke, and large quantities are also disposed of in the company's area.

# Chemical Industry Lawn Tennis Tournament

## Only Nine Days to Closing Date

ENTRIES for the second annual Chemical Industry Lawn Tennis Tournament, in competition for THE CHEMICAL AGE Silver Cup, will close on Monday, May 2. There is, therefore, an interval of only nine days in which to send in the entry forms. The tournament is limited to men's doubles and is open to all engaged in any capacity in the chemical industry throughout the country. Country members of the industry are particularly invited to compete. For all the earlier rounds of the tournament, the country will be divided into areas, so that opposing pairs may obviate the inconvenience of travelling considerable distances and may meet each other as near home as possible.

### Rules

1. Every competitor must be a member of the chemical industry, either as a principal or a member of a staff. There is no entrance fee of any kind.
2. Each pair must be members of the same, or an associated, firm.
3. The Challenge Cup shall be competed for annually on courts of any surface in accordance with the Rules of Lawn Tennis and the Regulations of the Lawn Tennis Association. The winners of the Cup shall make arrangements for its safe custody and insurance.
4. The competition shall be conducted on the knock-out principle, and the best of three advantage sets shall be played in all matches.
5. **Entries shall be made not later than May 2, 1932, and addressed:**

**"Lawn Tennis Tournament,"**
**"The Chemical Age,"**
**Bouverie House,**
**Fleet Street, London, E.C.4.**

6. The draw shall be made on the first convenient day following the close of entries. The dates on or within which the several rounds must be played will be published in THE CHEMICAL AGE.
7. The Editor of THE CHEMICAL AGE shall have the right to scratch any players who fail to play off their matches by the stipulated dates, or who otherwise fail to conform with the rules and regulations governing this competition.
8. Except in the case of the special period set apart for the final stages of the competition, players drawn against each other must make their own arrangements for playing off their match on a court mutually agreed upon. In the event of disagreement, the first name drawn shall have the right to choose the ground.
9. In the general interests of competitors throughout the country it has been decided to divide into areas as far as possible all matches up to, and including, the Semi-Finals, the rule as stated under Clause 8, however, still standing.
10. The result of each match must be sent by the winners to the Editor of THE CHEMICAL AGE, signed by all four players (winners and losers) immediately after the match, and must reach the office of THE CHEMICAL AGE not later than by the first post on the day following the final day for playing off the round.
11. If any player be not present at the agreed place or time of the match, opponents shall be entitled to a walk-over, after having allowed reasonable time (say, a maximum of one hour) for the others' appearance. If the players find it impossible to play off their match on the day originally chosen, they must play it on any other day, to which both sides agree, within the stipulated period.
12. Any dispute arising between players, or otherwise, shall be referred to the arbitration of the Editor of THE CHEMICAL AGE, whose decision shall be final.
13. While competitors will make their own arrangements as to hard or grass courts for the preliminary rounds, it must be understood that the Finals will be played on hard courts.

**[The Latest Date for Receiving Entries is May 2, 1932].**

*Cut along this line and post as directed.*

### Entry Form

We have read the Rules of THE CHEMICAL AGE Lawn Tennis Tournament, and agree to abide by them.

*Name of Competitor* ..... *Name of Competitor* .....

*Name of Firm* ..... *Name of Firm* .....

*Firm's Address* ..... *Firm's Address* .....

..... .....

*Telephone No.* ..... *Telephone No.* .....

## Chemical Industry in Germany

### Wages and Hours during 1931

THE German Federal Statistical Office carried out in June, 1931, an inquiry into the actual earnings and hours of labour of the principal classes of workers in the German chemical industry, the chief results of which have now been published in its official journal *Wirtschaft und Statistik* for March 29. This is the second inquiry into this industry undertaken by the Federal Statistical Office.

The present inquiry covers 108 undertakings and 59,466 workers, *viz.*, 48,631 males 21 years of age and over (including 34,563 male "factory workers"—*Betriebsarbeiter*, and 14,068 skilled workmen—*gelernte Handwerker*) and 10,835 women 20 years of age and over, employed in productive processes. The previous inquiry covered 86,269 workers in 110 undertakings. A comparison of the results of the 1931 with those of the 1928 inquiry shows that, in 1931, the average hourly earnings of male workers had decreased by 3.4 per cent. while their average weekly working hours and weekly earnings had decreased by 14.0 and 16.9 per cent. respectively.

Comparison with pre-war earnings is possible only in one case of workers employed on time-work. For male "factory workers" and skilled workmen, average hourly earnings in 1931 were 88.8 per cent. higher than in 1913; as, however, weekly hours of work declined during the period by 19.7 per cent., the average weekly earnings of these workers were only 51.3 per cent. higher in 1931 than in 1913. After allowance had been made for the fact that deductions from wages in the form of wage-tax and social insurance contributions rose from between 5 and 6 per cent. of the average earnings in 1913 to between 11 and 12 per cent. in 1931, and also for the change in the cost of living during the period, real hourly earnings of male time-workers in the German chemical industry were found to have increased by about 28 per cent., whilst real weekly earnings had increased by only about 2.8 per cent. A statistical table taken from this survey will be found in the April issue of the *Ministry of Labour Gazette*.

## Society of Chemical Industry

### Birmingham and Midland Section

MR. H. W. ROWELL was elected chairman of the Birmingham and Midland Section of the Society of Chemical Industry at the annual meeting, held at the Birmingham Chamber of Commerce, on Tuesday, April 19. Dr. E. D. Mason (the retiring chairman) and Mr. D. W. Parkes were appointed vice-chairmen, and Mr. W. T. Collis and Mr. G. King were re-elected honorary treasurer and honorary secretary respectively. Dr. E. K. Rideal, Professor of Colloid Chemistry at Cambridge University, gave a lecture on "The Properties of Films."

# News from the Allied Industries

## Sugar Industry

INCREASED PREFERENCE FOR EMPIRE REFINED SUGAR is being urged by the Imperial Association, in Jamaica, in a resolution sent to the West India Committee and other interested bodies in England. They are asked to support the industry's claim for this adjustment of the "serious disadvantages under which it is labouring."

## Petroleum

NEGOTIATIONS FOR A SETTLEMENT of the details of the oil concession on the west bank of the Tigris of the British Oil Development Co. are actively progressing and it is expected that the whole matter will be settled before the Iraq Parliament rises, probably at the end of April. One of the British directors, who lately left London for the purpose, has just arrived at Baghdad to confer with Nuri Pasha and continue the negotiations. There are also some British technical experts. The concession, which was arranged during the recent visit of the Iraq Prime Minister to London, was formally announced by Nuri Pasha in the Iraq Parliament last month.

## Non-Ferrous Metals

THE INTERNATIONAL ALUMINIUM CONVENTION, which was established by 28 German, Austrian, Belgian, Dutch, Swiss and Czechoslovakian aluminium works, and which regulated sales in Scandinavia, Austria, the Balkans and Holland, has been dissolved. The convention has been in existence for only one year.

IT IS REPORTED FROM RHODESIA that the Union Minière du Haut Katangs intend to repudiate the copper quota agreement with America. The Union Minière is a Belgian copper mining company which controls the output of the Congo. According to an agreement signed in New York by the producers controlling 90 per cent. of the world's copper output, the Union Minière is allowed to produce up to about 82,000 tons of copper annually. Of these 82,000 tons authorised as from as from January 1, 1932, 30,000 should, according to the agreement, remain in stock in the African mines until required.

## Artificial Silk

THE PETITION FOR THE WINDING-UP of Anglo-French (Verdun) Artificial Silk, Ltd., originally heard on November 9 last year, and allowed to stand over on seven occasions, has now been dismissed without costs.

THE HEARING OF THE PETITION for the winding-up of the Bulmer Rayon Co. has been adjourned until May 2, in order that shareholders may express their views at forthcoming meetings, and vote on the scheme for the voluntary liquidation and reconstruction of the company. Any shareholder who does not vote in favour of the special resolutions and expresses his dissent in writing addressed to the liquidator and left at the registered office of the company within seven days after the passing of the resolutions will be entitled to require the liquidator either to abstain from carrying the resolutions into effect or to purchase his interests in the company at a price to be determined by agreement or by arbitration.

IN THEIR REPORT for the year ended December 31, 1931, the directors of the British Enka Artificial silk Co., Ltd., announce a net loss of £78,278. The actual year's working produced a profit of £34,546, but £79,710 depreciation on buildings, plant, etc., £13,884 debenture interest, the allocation of £13,889 for unrealised loss on exchange, and sundry other items, reduced this to the loss stated. At the annual meeting Mr. C. T. Pott, who presided, claimed that the small working profit earned during the year was encouraging in comparison with the loss of £72,139 made in the previous year. In the early months of the year the company found business dull, but afterwards demand improved and stocks decreased. In September demand increased rapidly, but by that time the plant was already working to capacity, and the output had been sold in advance. British Enka is the second largest producer of viscose in this country, but their productive capacity is considerably below that of the largest producer.

## Tanning

AFTER REMAINING IDLE for some considerable time, the Wellingborough tannery of Nicholsons, Sons, and Daniels, Ltd., was reopened last week. All plant and equipment has been thoroughly overhauled and brought up to date. For the time being it is not intended to run the factory at full capacity, but in the re-equipment an increase of output has been taken into consideration, and the necessary plant has been installed.

## Iron and Steel

THE ENGLISH STEEL CORPORATION, LTD., which is controlled by Vickers-Amstrongs, Ltd., in its accounts for 1931 shows a trading loss, before providing for depreciation, etc., of £10,524, against a trading profit of £27,701 in 1930. With loan interest, etc., less dividends, received, the net loss was £46,011, making a total loss of £450,775. This loss it is proposed to deal with under the capital reduction scheme, which involes the writing off of 19s. on each £1 ordinary share.

## China Clay

PRESIDING AT THE ANNUAL MEETING of Tehidy Minerals, Ltd., held at Cambourne on April 16, Mr. C. V. Thomas, chairman of the company, said he understood the position of the china clay industry was receiving careful attention from those actively connected with it, and it was hoped that the steps contemplated to secure adequate prices would succeed. He thought attention might be paid to the question of whether there should not be some tariff in respect of green earth, ochre and other materials used in the manufacture of paint and possibly other products found in the highly mineralised county of Cornwall. It was resolved to forward copies of Mr. Thomas's speech to the president of the Board of Trade and to the Minister of Mines.

## Rubber

NEW USES FOR RUBBER are discussed in the annual report of the Council of the Rubber Growers' Association. The propaganda committee, it is stated, have continued to direct and concentrate attention upon the applications of rubber. The low price of the commodity has encouraged investigation into its application for a variety of purposes, although it is pointed out that the results will not become fully apparent until there is a general improvement in world trades. Among recent developments, is the growth of the use of rubber flooring. The published preliminary figures of the last census of production show that the demand for rubber mats, flooring, etc., in this country has increased threefold in the last six years, and is now responsible for over 7,000 tons of manufactured rubber per annum. Increased interest is also being evinced in rubber upholstery. The recent announcement that the London General Omnibus Co. has fitted sponge rubber upholstery in all its new 'buses is a striking illustration of the potentialities of sponge rubber.

## United States Production of Sulphur, 1931

PRODUCTION, shipments, and exports of sulphur in 1931 showed marked decreases in comparison with 1930, according to a report issued by the United States Bureau of Mines. Sulphur production amounted to 2,128,930 long tons, a decrease of 17 per cent. from the record output of 2,558,981 tons in 1930. Shipments declined from 1,989,930 tons, valued at about £7,200,000 in 1930, to 1,376,526 tons, valued at £5,000,000 in 1931, or 31 per cent. both in quantity and in value, and were the smallest recorded since 1922. Stocks of sulphur at the mines increased steadily and amounted to 3,250,000 tons on December 31, 1931, a net gain of 753,000 tons for the year. These stocks were approximately 250,000 tons higher than the previous record stocks on hand at the mines at the end of 1923. As in 1930, Texas was the only sulphur-producing State. Exports of sulphur or brimstone in 1931 totalled 407,586 long tons, compared with 593,312 tons in 1930, a decrease of 31 per cent. Exports to all the countries that receive important quantities of American sulphur, with the exception of those to France, showed large decreases. Germany received 82,218 tons, compared with 120,569 tons in 1930; France, 73,457 tons, compared with 56,190 tons; the United Kingdom, 23,635 tons, compared with 28,683 tons.

## Production of Selenium in Canada

### A New Development

SELENIUM is the latest addition to the refined metal products now being produced in Canada. It is obtained as a by-product in copper refining and was produced for the first time in Canada early in 1931 at the plant of the Ontario Refining Co., Ltd., Copper Cliff. When market conditions improve it is also likely to be recovered at the new refinery of Canadian Copper Refiners, Ltd., at Montreal East. Canada is therefore now in a position to produce selenium in large quantities, but the market for any output is at present restricted.

Selenium is not very abundant in nature, although fairly widely distributed. It is found associated with sulphur compounds and often accompanies the sulphides of heavy metals in the form of selenides. In the electrolytic refining of copper it remains in the slime or residue from which it is afterwards extracted. In its refined form it is characterised by a unique action toward light, which has made possible the development of the photo-electric cell. The element finds its present chief market in the glass industry where it is used as a colouriser and for neutralising other colours; it is also used in the pottery industry for the same purpose. In the manufacture of rubber products it serves as a vulcanising and accelerating agent, and because of its reputed properties of increasing the resistance to abrasion of rubber up to as much as 80 per cent., it may have a large potential market in this industry. One of the most important potential uses is in the production of selenium cells for television transmission and reception. The normal price of selenium during 1931 was about 8s. per lb. It is generally sold in the form of an amorphous powder, or as small rods and buttons.

## Poisons and Poisoning

### Dr. Roche Lynch's Address

DR. G. ROCHE LYNCH, the Senior Analyst of the Home Office, addressed a large and representative joint meeting of the Northern Section of the Society of Public Analysts and the Manchester and Liverpool Sections of the Institute of Chemistry on April 9, at the Engineers, Club, Manchester. Selected officials, attached to constabulary services in the Manchester area, also attended the meeting by special invitation. The subject of the address was "Poisons and Poisoning."

The lecturer dealt with his subject from the historical point of view, and, in a critical survey of the various factors governing toxicological investigations, made many illuminating references to certain classical poisoning cases of recent years in which he personally took an active part.

Owing to the absence of Mr. John Evans (Sheffield), the chair was taken by Professor W. H. Roberts (Liverpool), and amongst those present were Professor Hilditch, Dr. J. T. Dunn (immediate Past President of the Society of Public Analysts, Dr. A. Coulthard and Messrs. M. Barrowcliff, H. Brindle, U. Coates, G. D. Elsdon, H. Heap, E. Gabriel Jones, W. Marshall, S. E. Melling, C. J. H. Stock and Roland Williams.

## Cadmium Red Pigments

### Production in Germany

CADMIUM RED is manufactured by four concerns in Germany and two distinct processes are employed. In 1907 the pigment manufacturer, de Haen, produced a vivid red pigment from cadmium sulphide and selenium. This pigment, used as enamel under the names Cadmium Rot, Feuerrot, or Selen Rot is prepared by heating 80 to 90 parts of cadmium sulphide with 10 to 20 parts of selenium in a muffle furnace to 700° C. The hues range from orange-red to deep purple red and are used to coat colourless glass and to produce many coloured art glass. The other process more recently developed by the I. G. Farbenindustrie consists of precipitating cadmium salts with a mixture of barium sulphide and barium selenide. These pigments range from orange, through pure red to deep magenta red. The patent for the process is controlled by the Bayer concern.

## Nickel as a Catalyst for Hydrogenation

### A Study of its Preparation

A STUDY of the preparation of nickel catalysts contributed to the April issue of the *Journal of the American Chemical Society* shows that the amount of nickel held by the support and the proportion of the nickel compounds which are reducible to metallic nickel are a function of the precipitant and procedure of precipitation, as is also the optimum time and temperature for the reduction of the nickel oxides to the active catalyst. On the basis of this and previous investigations a procedure has been recommended which results in easily reproducible and very active nickel catalysts. The authors, L. W. Covert, R. Connor and H. Adkins, state that the incorporation of several different elements into the nickel catalyst promoted the hydrogenation of toluene, acetone and of the di-ethyl acetal or furfural. These so-called promoters are so specific in their action that an element that promotes the hydrogenation of one compound may inhibit that of another. It has been found possible through the addition of various substances, especially of certain amines, to so control the hydrogenation of di-ethyl furfural acetal as to raise the yield of di-ethyl tetrahydrofurfural acetal from a few per cent. to 75-80 per cent. of the theoretical, there being a corresponding decrease in the yield of ethyl tetrahydrofurfuryl ether. The addition of *n*-amylamine had a similar but smaller effect in increasing the yield of cyclohexylcarbinol from benzyl alcohol. Three cyclic acetals of benzaldehyde were subjected to hydrogenation under various conditions but in no case was there any evidence for the formation of hexahydrobenzaldehyde or its acetals. The products were hydrocarbons, ethers, hydroxy ethers and glycols.

## British Goods in Denmark

### The Forthcoming Exhibition

ON September 24 there will be opened in Copenhagen an all British exhibition under the patronage of the Prince of Wales and the Crown Prince of Denmark. This exhibition, which will continue until October 9, is being organised in Great Britain by the Federation of British Industries, and owes its inception largely to the desire expressed by the Danes to increase their trade with this country, and to be given the opportunity of seeing in their own country the products of British manufacturers. All exhibits must be the product of, or manufactured in Great Britain and Northern Ireland, the Dominions, Colonies or Dependencies. Exhibitors are asked to use to the greatest degree possible British-made materials throughout in stand fitting and equipment, and the management is reserving the right to insist upon the substitution of British for foreign material wherever procurable.

All sections of British manufacturers will be represented at this exhibition, and the F.B.I. is assured of the co-operation of many of the principal firms in the country. An interesting feature of many of the inquiries received is the fact that manufacturers are making an extensive study of the potentialities of the market before arranging their exhibits. The opportunities offered in Denmark, to British manufacturers, are extensive. In 1931 only 15 per cent. of the total imports into Denmark came from Great Britain and apart from the chances of those firms who already do business in the country increasing their trade, there are many new markets into which British manufacturers can reasonably hope to enter.

## Production of Sulphur

### Use of Canadian Pyrites

THE *Canadian Mining and Metallurgical Bulletin* for March, issued by the Canadian Institute of Mining and Metallurgy, reprints a paper entitled "Pyrite Flotation at Aldermac, Quebec," prepared by Mr. W. G. Hubler, for discussion at the annual general meeting of the Institute to be held at Montreal this month. Active development of the Aldermac pyrite deposits is now in progress, the object being to extract therefrom an alternative for the native sulphur hitherto imported by Canadian pulp and paper mills for the manufacture of acid and sulphate pulp. The paper quoted describes the operations at the mine, together with the milling and flotation processes. Persons interested may consult a copy of the paper at the Reference Library, Canada House, Trafalgar Square, S.W.1.

# From Week to Week

A NEW FACTORY for the grading and cleaning of carrageen moss has been established at Blacksod, County Mayo, Ireland.

MR. ISAAC FOOT, M.P., Secretary for Mines, announces that he has appointed Professor O. T. Jones to be a member of the Safety in Mines Research Board.

MR. F. ROBERTSON DODD, Aughton, Ormskirk, has been selected to succeed Professor Hilditch in the chair of the Liverpool and North-western Section of the Institute of Chemistry.

THIEVES ENTERED THE PREMISES of the Leyton Manufacturing Co., chemical manufacturers, of Hainault Road, Leyton, late on Saturday, April 16, and stole bottles containing unrefined mercury, weighing over half a ton, valued at about £130.

IT HAS BEEN OFFICIALLY ANNOUNCED in Washington that the south-western area of the United States contains potash deposits which are equal or superior in quality to the deposits in Germany and Alsace, which have hitherto been the world's principal sources of supply.

IMPERIAL CHEMICAL INDUSTRIES, LTD., at Billingham-on-Tees, has cut down the staff at its oil-from-coal plant from 250 to 12. The demonstrations which have been given in the extraction of oil from coal have been successful, but it is understood that the time is not ripe for the product to compete with petrol.

IN A WORKMAN'S COMPENSATION CASE at Dartford County Court, John Robert Ward, analytical chemist, of 83 Bexley Road, Erith, sought to recover compensation from Fraser and Chalmers, Ltd., Erith. It was stated that a settlement had been arrived at on payment of £75, the respondents to pay applicant's costs. Counsel said it was unfortunate that applicant had contracted dermatitis during his apprenticeship, and it would be unsafe for him to go back to his old work; nevertheless he still had working capacity. The judge approved the settlement.

ACCORDING TO THE CURRENT ISSUE of the *Ministry of Labour Gazette* insured persons in Great Britain and Northern Ireland registered as unemployed on March 21 included the following groups:—Chemicals, wholly unemployed 15,746, temporary stoppages 956; explosives, wholly unemployed 1,737, temporary stoppages 277; paints, varnish, red and white lead, wholly unemployed 1,986, temporary stoppages 155; oil, glue, soap, ink and matches, wholly unemployed 8,359, temporary stoppages 1,222; coke ovens and by-product works, wholly unemployed 3,152, temporary stoppages 387.

A DEPUTATION REPRESENTING THE UNIVERSITY COUNCIL OF WALES has had an interview with the University Grants Committee concerning grant questions. The Glamorgan County Council, together with Cardiff, Newport, and Monmouthshire, are now making a contribution of £2,150 per annum towards the new chemistry and physics laboratory, but so far this has not been recognised for the £ for £ grant. The deputation urged that this should be granted, so that the local authorities can obtain a 50 per cent. grant upon their contributions. The matter is being sympathetically considered in regard to future grants, but the chairman of the grants committee pointed out considerable difficulties in the way.

AN APPLICATION made on behalf of the Imperial Chemicals (Fertiliser and Synthetic Products), Ltd., Billingham, for the diminution or termination of compensation paid to Hugh Cope, a labourer, of Thornaby, was refused by Judge Richardson at Stockton County Court this week. It was stated that the man had sustained an injury to his back in February, 1929, and that he had been paid compensation at the rate of 30s. a week. Some weeks after the accident the man had returned to work and had carried out light duties, but had later stayed off, and compensation had been resumed in full. The application was made on the grounds that the man was not totally incapacitated, but Mr. T. Bowman, of Stockton, who appeared for the man, alleged that the man had sustained severe spinal injury as a result of the accident. Conflicting medical evidence was called by both sides.

RECENT WILLS include:—Mr. Thomas Clayton Brown, of 19 Longley Road, Huddersfield, director and secretary of L. B. Holliday and Co., Ltd., manufacturing chemists, £3,607 (net personalty £3,466). Mr. Mosetse Stephenson, of 45 Botany Brow, Chorley, colour manufacturer, £10,117 (net personalty £10,046).

A SUM OF £500 HAS BEEN ALLOCATED in County Cork to provide a small subsidy for each barrel of burnt lime produced at the kilns throughout the district in order to enable farmers to purchase the lime at an economic price.

MR. W. G. MITCHELL, general manager of the National Oil Refineries at Glandarcy, near Swansea, recently delivered a lecture at Swansea to members of the Welsh Branch of the F.I.S.A. on "Petroleum Products and their use in the Motor Transport Industry."

THE LONDON SECTION of the British Association of Chemists will hold its annual general meeting at the Broad Street Station Restaurant, London, on May 13 (instead of May 6, as previously notified) at 7 p.m. The meeting will be followed by a smoking concert at 8.15 p.m.

MR. CLARENCE A. SEYLER, the Welsh authority on by-products and fuel, was last week presented with a gold medal and certificate by the South Wales Institute of Engineers in recognition of his contributions on fuel technology, and the classification of coals. The presentation was made by Mr. D. F. Davies, president of the Institute.

THE HOME OFFICE has issued a revised edition of its pamphlet dealing with seats for workers in factories and workshops. This pamphlet (*Welfare Pamphlet No.* 6, H.M. Stationery Office, price 1s. 2d. post free) deals with the general principles to be observed in regard to seating, in such matters as posture, etc.; with the design, construction, and adjustment of seats for working purposes; and with the provision of suitable seats for occasional use in workrooms, or for rest or mess-rooms.

ENCOURAGED BY THE RESULTS obtained with its original liquefied lead known as "Nust," the Non-Rust Liquid Lead Co., Ltd., of Iddesleigh House, Caxton Street, S.W.1, has concentrated on developing the production of this extremely fine metallic pigment which accelerates the formation of a metallic coating impervious to corrosion and moreover introduces the further valuable characteristic whereby the pigment is entirely suspended in the requisite proportion of conveyor medium. The company's expert staff is at the service of prospective users.

THE ANNUAL GENERAL MEETING of the Institute of Fuel was held at Burlington House, Piccadilly, London, on April 13, Mr. C. McEwen presiding. The business of the meeting was quite formal, the report and accounts being taken as read and unanimously adopted. The report reviewed the work done during the past year and recorded a diminution in the revenue, although the membership had been fairly well maintained. The chairman expressed the view that having regard to the industrial conditions during the year the position of the Institute must be regarded as satisfactory.

TO BID A FORMAL FAREWELL to Mr. T. Mortimore Sparks, who is relinquishing the editorship of the *Timber Trades Journal*, which since September, 1926, he has guided with marked success through a troublesome industrial upheaval, a small party of colleagues and friends were entertained at luncheon by Sir Ernest Benn at the Waldorf Hotel, on Monday, April 18. Included in the party were directors of Benn Brothers, Ltd., proprietors of the *Timber Trades Journal*, editors of associated papers and others of the staff, whilst the timber trade was represented by Messrs. E. C. Horton, J. L. Baynes and E. P. Tetsall, respectively president, vice-president and immediate past-president of the Timber Trade Federation of the United Kingdom; H. G. Sharp, president of the Timber Trades' Benevolent Society; R. B. Vick, chairman of the Timber Trade Technical Education Committee; L. Arnott and H. E. Newsum, J.P., vice-president of the Federated Home-Grown Timber Merchants' Association.

### Obituary

MR. R. W. FARR, of Whitley Bay, formerly representative of the Newcastle Chemical Co. and later of the United Alkali Co. when the northern merger took place.

# Patent Literature

*The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2. at 1s. each.*

## Abstracts of Accepted Specifications

**363,445. Destructive Hydrogenation.** P. J. Askey, R. Holroyd, Norton Hall, The Green, Norton-on-Tees, C. Cockram, Winnington Hall, Northwich, Cheshire, and Imperial Chemical Industries, Ltd.

Carbonaceous materials are destructively hydrogenated in the presence of stannous formate, oxalate, or acetate, or tin tetraphenyl, which are decomposed during the reaction.

**364,144. Hydrocarbons.** J. Y. Johnson, London. From *I. G. Farbenindustrie.*

Gases containing methane are passed through a quartz tube across a catalyst consisting of or coated with chromium or graphite, *e.g.*, a chromed iron rod heated electrically to 1,100° C. A condensate is obtained consisting of benzene and a thin tar. In another case, graphite rods may be heated to 1,200° C. by hot reducing gases which are introduced periodically, the condensate in this case containing 70 per cent. of benzene.

**364,418. Acetylene.** Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij, 30 Carel van Bylandtlaan, The Hague. (Assignees of R. W. Miller.)

Hydrocarbons such as gasolene, kerosene, lubricating oils, etc., are converted into acetylene by means of a flame of oxygen or air in the gaseous hydrocarbon, in the absence of liquid or under the surface of the liquid hydrocarbon. If the jets are of small diameter and arranged in a group, the yield of acetylene is increased.

**364,537. Wetting Agents.** J. Y. Johnson, London. From *I. G. Farbenindustrie.*

Aromatic hydrocarbons or their halogen, hydroxy, or amino compounds or sulphonic acids, are condensed with aliphatic alcohols, or their esters, and sulphonated if necessary. Phosphorus tri-chloride or acetylchloride may be present as a catalyst. The hydrocarbon may be sulphonated and then alkylated, or alkylated and then sulphonated, or alkylated and sulphonated simultaneously. The products are more efficient as wetting and dispersing agents than the mono and di-alkylated products. In an example, naphthalene $\beta$-sulphonic acid is treated with isopropyl alcohol and concentrated sulphuric acid to obtain multi-propylated $\beta$-naphthalene sulphonic acid.

**364,574. Fatty Acids.** J. Y. Johnson, London. From *I. G. Farbenindustrie.*

Hydrocarbons are oxidised with nitric acid or nitrogen oxides and the resulting fatty acids are freed from nitrogen by heating with caustic soda or potash, lime or with inorganic acids to 150°-300° C. The nitrogen compounds are mostly volatile and the non-volatile part is dissolved by the inorganic acid subsequently used to liberate the fatty acids. The purified product instead of being precipitated with inorganic acid, may be treated with enough fatty acid to combine with the excess of alkali. The crude oxidation product may be bleached with chlorine or hypochlorous acid, and the hydrochloric acid produced may be used for the acid purifying treatment. Some examples are given.

**364,628-9. Purifying Crude Anthracene, etc.** Selden Co., McCartney Street, Pittsburg, U.S.A. Assignees of A. O. Jaeger, 331 Orchard Drive, Pittsburg, and L. C. Daniels, 313 Barr Avenue, Crafton, Pa., U.S.A.

364,628. The impurities in crude anthracene, acenaphthene, phenanthrene and carbazole are removed by the selective solvent action of chlorinated hydrocarbons such as monochlorbenzene, *o*-dichlorbenzene, chlorinated paraffin hydrocarbons, or the chlorinated residue from the chlorine purification of crude benzol fractions. The mixture is fractionally sublimed, when the less soluble constituents tend to volatilise first, *e.g.*, phenanthrene is removed from a crude anthracene containing phenanthrene and carbazole. Purified anthracene may be further treated for the recovery of carbazole by heating with caustic alkali and distilling off or otherwise removing the anthracene.

364,629. The above process is modified by subliming the substance to be purified with vapours of a liquid compound containing the furane or hydrogenated furane nucleus such as furfural, methyl furfural, tetrahydro-furfuryl alcohol, etc. Chlorinated hydrocarbons may also be added.

**364,665. Hydrocarbons, Fatty Acids and Methanol.** J. Y. Johnson, London. From *I. G. Farbenindustrie.*

Chemical reactions at high temperature and pressure, *e.g.*, destructive hydrogenation of coal, are effected in a number of parallel pressure-resisting tubes rotating about an axis parallel to their axes, and internally or externally heated. Solid or viscous materials may be moved by worm conveyers or spiral bands, and catalysts may be mixed with the materials or the tubes may be composed of catalytic material. Gases may be introduced at the ends or at points where the tubes may increase in diameter. The apparatus is suitable for the condensation of unsaturated or aromatic hydrocarbons, the polymerisation of acetylene, oxidation of hydrocarbons to fatty acids, synthesis of methanol, and reduction of carbon monoxide to hydrocarbons.

**364,225. Cyanamide.** H. Wittek, 4 Kantstrasse, Beuthen, Silesia, Germany.

Cyanamides of divalent metals are obtained by heating the oxides to red heat at atmospheric pressure in the presence of ammonia and carbon dioxide. The nitrogenisation is facilitated by adding halides, cyanamides, oxides or carbonates of the alkali metals. The mixture of ammonia and carbon dioxide may previously be passed over catalysts having an imide-forming or water-removing action, such as alumina, silica, calcium cyanamide, oxides of rare earths, copper, manganese, active charcoal, etc. The product may be treated with carbon dioxide to remove any alkalinity, and it may then be used as a fertiliser.

## Specifications Accepted with Date of Application

369,905. Substances adapted for use as mordants, Manufacture of. Imperial Chemical Industries, Ltd., E. Chapman and E. B. Robinson. December 29, 1930.

369,936. Metalliferous azo dyestuffs, Manufacture of. A. G. Bloxam. (*Soc. of Chemical Industry in Basle.*) Dec. 23, 1930.

369,963. Maleic acid or its anhydride, Manufacture of. J. Y. Johnson. (*I. G. Farbenindustrie.*) Dec. 17, 1930.

369,946. Alkyl or aralkyl pyridones or quinolones, Preparation of. Ilford, Ltd., and F. M. Hamer. Dec. 24, 1930.

369,976. Coal, Production of sub-products from—by means of solvents. H. Hardy. May 20, 1930. Addition to 356,236.

369,985. Compositions adapted for use as emulsifying agents. Imperial Chemical Industries, Ltd., H. M. Bunbury and R. P. McGlynn. Nov. 29, 1930.

369,991. Azo-dyestuffs containing chromium, Manufacture of. Soc. of Chemical Industry in Basle. Dec. 18, 1929.

370,037. Dyestuffs of the anthraquinone series, Manufacture of. Imperial Chemical Industries, Ltd., and A. G. Perkin. Dec. 31, 1930.

370,088. Composite titanium pigments, Manufacture of. Titanium Pigment Co., Inc. Jan. 29, 1930.

370,121. Lithopone, Manufacture of. J. Guillissen and Union Chimique Belge Soc. Anon. Feb. 19, 1931.

370,136. Conversion of olefines into alcohols. Distillers Co., Ltd., W. P. Joshua, H. M. Stanley, and J. B. Dymock. Feb. 25, 1931.

370,211. Alkyl halides, Manufacture of. I. G. Farbenindustrie. April 29, 1930.

370,235. Camphene, Production of. Schering-Kahlbaum Akt.-Ges. May 26, 1930.

370,252. Crotonaldehyde condensation. A. L. Bloomfield and L. W. E. Townsend. June 4, 1931.

370,278. Ammonium nitrate, Production of. N. Carot and A. R. Frank. July 10, 1931.

370,295. Sulphur-containing splitting products of the acid hydrolysis of keratin and keratin substances, Manufacture and separation of. A. Von Wulfing and E. Moller (trading as J. A. Wulfing), and E. Sturm. July 29, 1931.

370,300. Formic acid from formates, Manufacture of. Lonza Elektrizitätswerke und Chemische Fabriken Akt.-Ges. Aug. 10, 1930.

370,350. 4-aralykyl-3-keto-3 : 4-dihydro-1 : 4-benzoxazines, Manufacture of. F. Hoffman-La Roche & Co., Akt.-Ges. April 17, 1931.

370,356. Methane derivatives containing chlorine and fluorine, Manufacture of. I. G. Farbenindustrie. Dec. 12, 1930.

## Applications for Patents

*[In the case of applications for patents under the International Convention, the priority date (that is, the original application date abroad which the applicant desires shall be accorded to the patent) is given in brackets, with the name of the country of origin. Specifications of such applications are open to inspection at the Patent Office on the anniversary of the date given in brackets, whether or not they have been accepted.]*

Carpmael, A. (*I. G. Farbenindustrie.*) Manufacture of azo dyestuffs. 10510. April 12.

Carter, P. G., Imperial Chemical Industries, Ltd., Loveluck, R. J., and Thomson, R. F. Manufacture of anthraquinone derivatives. 10635. April 13.

Du Pont de Nemours & Co., E. I. Preparation of arylamines. 10301. April 11. (United States, April 11, '31.)

Fettsäure-und Glyzerin-Fabrik Ges. Making sulphonated oleic acids, &c. 10762. April 14. (Germany, April 14, '31.)

Johnson, J. Y. (*I. G. Farbenindustrie.*) Manufacture of anthraquinone derivatives containing nitrogen. 10302. April 11.

—— Manufacture of dyestuffs, &c. 10303. April 11.

—— Manufacture of carbonic acid chloride. 10831. April 15.

—— Manufacture of additional compounds of formyl halides. 10832. April 15.

—— Treatment of fibrous materials. 10833. April 15. (Sept. 26, '31.)

I. G. Farbenindustrie Akt.-Ges. Manufacture of aqueous finishings and body colours. 10390. April 11. (Germany, April 10, '31.)

—— Manufacture of softening agents. 10391. ( April 11. (Germany, April 10, '31.)

—— Manufacture of quinoline-8-azo compounds of quinone series. 10392. April 11. (Germany, Aug. 8, '31.)

—— Producing homogeneous solutions of drying agents. 10476. April 12. (Germany, May 2, '31.)

—— Manufacture of dye solutions capable of being injected for therapeutic purposes. 10861. April 15. (Germany, April 16, '31.)

Imperial Chemical Industries, Ltd., and Oakeshott, S. H. Sulphuric esters with wetting, &c., properties. 10300. April 11.

—— Light-producing ignitable compositions. 10527. April 12.

—— and Piggott, H. A. Manufacture of alcohols, &c. 10636. April 13.

—— Processes for heat-treating metals. 10639. April 13.

—— Manufacture of plastic materials for production of insulated conductors. 10751, 10752. April 14.

—— Manufacture of fungicidal bodies. 10885. April 15.

Manersberger, A. E. Production of stearin and olein from fatty acids. 10888. April 15.

Roman, L. H. Manufacture of carbohydrates from aldehydes. 10578. April 13. (Oct. 14, '30.) (France, July 10, '30.)

Sherrett, H. N. (*Drug Products Co., Inc.*) Producing bismuth sodium gluconate, &c. 10650. April 14.

Spence & Sons, Ltd., P. Preparation for agricultural, &c., pest control, and manufacture thereof. 10900. April 16.

Triggs, W. W. (*Du Pont de Nemours and Co., E. I.*) Preparation of ketones. 10966. April 16.

## X-Ray Crystal Analysis

### Exhibition at the Royal Institution

THE discourse to be given by Sir William Bragg at the Royal Institution conversazione on Friday evening, May 6, will be related to the various developments in pure and applied science which have depended on the use of the X-ray methods of analysing crystal structure. In order to supplement the discourse, which cannot refer to more than a few of the more important points, an exhibition is being arranged in the rooms of the Royal Institution which will demonstrate more fully the work that has been done. The contributors will be those who have carried on research work in this subject in various British laboratories, so that the result should be interesting and, as far as space allows, comprehensive. As there may be many who, being interested in these developments, would like to see the display, the Managers of the of the Royal Institution would like it to be generally known that all members of scientific societies or senior students of universities and technical institutions, and others interested in this work will be welcome if they present themselves at the Royal Institution, 21 Albemarle Street, W.1, at any time between 10 a.m. and 6 p.m. on Monday, May 9, or Tuesday, May 10.

### Sulphur in Norway

FOLLOWING satisfactory trials in sulphite plants of sulphur extracted from pyrites by the new process of the Orkla Grube-Aktiebolag, a plant for treatment of about 200,000 tons of pyrites annually is said to have been built at Thamshavn, but the daily production capacity, reported to be 200 tons of extracted sulphur, cannot be verified.

## Points from Manufacturers' Literature

*The Editor welcomes copies of new brochures and leaflets describing plant, equipment and products of interest to chemical manufacturers and the chemical using trades.*

ACID AND ALKALI RESISTING ENAMELLED WARE manufactured under a patent vacuum process by Eisenwerke Kaiserslautern is described in a leaflet received from L. A. Mitchell, Ltd., of 37 Peter Street, Manchester. This leaflet is an extract from the general catalogue issued by this particular manufacturer of enamelled ware, which has now been supplied to the chemical and allied industries for more than 40 years. Manufacture under the vacuum process is claimed to ensure the homogeneous adhesion of the enamel to the cast iron, thus making the enamel impervious to the action of all acids and weak alkaline solutions as well as to the influence of high temperatures. For depositing the enamel two processes are used according to the conditions which the enamel is required to withstand in service. The units illustrated in this leaflet cover a very wide range, and include various types of evaporating pans, boiling pans (capacities from 6½ to 920 gallons), distillation apparatus, mixing vessels (open and closed), montejus or pressure vessels, and mixing drums; there is also a cast-steel autoclave for working pressures up to 700 lb. and capacities up to 660 gallons.

* * *

INDUSTRIAL TEMPERATURE CONTROL is the subject of a special leaflet issued by The Drayton Regulator and Instrument Co., Ltd., of West Drayton, Middlesex. Drayton devices for industrial electric heat control comprise room switches, to break or make on increasing temperature; limit switches either for immersion or surface mounting; variostats for control of indoor temperatures in relation to outdoor temperatures; heat motor valves and electro-magnetically operated valves; electric relay valves to work in conjunction with air or water operated main valves; electrically controlled automatic mixing valves for constant temperature or temperature varied in relation to outside temperature; and pressure and temperature controls for electric heat storage cylinders. Whilst water or compressed air operation of the valves required for automatic control of air conditioning plant on account of the gradual action is recommended, wherever either operating medium at the requisite pressure is available, it may sometimes be necessary to resort to electric control. If reheaters are to be controlled from the temperature in distant rooms, direct water operation would be most inconvenient, and electric control, consisting of room thermostat and electric pilot valve controlling water operated main valve, is recommended. Where air is available for operation this does not apply, because small air pipes are as easily installed as electric wires and the question of draining—an important one with water operation—does not arise.

* * *

IN THE NEW STOCK LIST (No. 151) issued by Higgs Motors, of Witton, Birmingham, it is stated that in addition to the large stock of standard machines which are listed, this firm carries the components necessary for making up M.G. sets, battery charging sets and starting panels, at shortest notice. They are also in a position to supply special machines of all descriptions, such as totally enclosed, drip-proof and pipe ventilated mining patterns. As they have their own iron-foundry they can supply motors with special end shields, all sizes of pulleys, flexible couplings and bedplates for third bearing machines and motor generator sets.

* * *

A NEW RANGE OF REFINED ALLOY PIG IRONS containing varying proportions of nickel, chromium, vanadium, titanium, etc., are described in a brochure from Bradley and Foster, Ltd., of Darlaston, Staffs. These iron alloys are specially suitable for all classes of cylinders, cylinder linings and castings which are required to possess heat resisting, wear resisting and corrosion resisting properties. Bradley and Foster, Ltd., have been intimately connected with the developments in alloy cast irons since their inception and their research department has devoted considerable attention to the question of suitable refined alloy pig irons and suitable methods of manufacturing such pig irons to meet the needs of the alloy iron founders. They have designed special processes and erected special plant for the incorporation of alloy additions to refined pig irons under conditions which ensure the strictest accuracy and regularity of product.

# Weekly Prices of British Chemical Products

*The following notes on the chemical market conditions in Great Britain are based on direct information supplied by the British manufacturers concerned, and unless otherwise qualified the figures quoted apply to fair quantities, net and naked at makers' works. Where no locality is indicated, the prices are general for the United Kingdom. Particulars of the London chemical market are specially supplied to* THE CHEMICAL AGE *by R. W. Greeff and Co., Ltd., and Chas. Page and Co., Ltd., and those of the Scottish chemical market by Chas. Tennant and Co., Ltd.*

CONDITIONS in the London chemical market have shown little change during the current week, the demand continuing along quietly steady lines and about up to the average of previous weeks. Prices also show little change and continue steady. The market for coal tar products is unchanged from last week, prices remaining firm. Business in Scotland has been more active, with a slight increase in export inquiries. Although the general tendency of chemical prices on the Manchester market during the past week has remained very steady, there is little indication, at the moment, in any section of a further upward movement. As a matter of fact, the majority of the fluctuations that have occurred since our last report have resulted in slight shadings on balance, although none of them has been of an important character. Mainly because of relatively quiet conditions at the consuming end of the trade, sales of chemicals this week have not been at all extensive, and for the most part new demands are limited to parcels for prompt or near delivery dates.

## General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 40%, £19 15s. per ton d/d address U.K. in casks. London: Tech. 80%, £37 5s to £39 5s.; pure 80%, £38 5s. to £40 5s.; tech. 40%, £19 15s. to £21 15s.; tech. 60%, £28 10s. to £30 10s. SCOTLAND: Glacial 98/100%, £48 to £50; pure 80%, £38 5s.; technical 80%, £37 5s. d/d buyers' premises Great Britain. MANCHESTER: 80% commercial, £39; tech. glacial, £52.

ACID, BORIC.—SCOTLAND: Granulated commercial, £26 10s. per ton; B.P. crystals, £35 10s.; B.P. powder, £36 10s. in 1-cwt. bags d/d free Great Britain in one-ton lots upwards.

ACID, CHROMIC.—11d. per lb., less 2½% d/d U.K.

ACID, CITRIC.—1s. 1d. per lb. LONDON: 1s. 1d. to 1s. 1½d., less 5%. MANCHESTER: 1s. 1½d.

ACID, CRESYLIC.—97/99%, 1s. 7d. to 1s. 9d. per gal.; 99/100%, 1s. 10d. to 2s.

ACID FORMIC.—LONDON: £50 per ton. *£52.

ACID, HYDROCHLORIC.—Spot, 3s. 9d. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £23 10s. per ton; 50% by weight, £27 10s.; pale tech., 50% by vol., £27; 50% by weight, £32; 80% by weight, £52; edible, 50% by vol., £40. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £20 to £25 per ton makers' works, according to district and quality. SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £50 per ton in casks, £51 10s. in kegs, *£52 in casks d/d. SCOTLAND: 98/100%, £50 to £53 ex store. MANCHESTER: £2 10s. per cwt., ex store.

ACID, SULPHURIC.—Average prices f.o.r. British makers' works, with slight variations owing to local considerations: 140° Tw. crude acid, £3 per ton; 168° Tw. arsenical £5 10s.; 168° Tw. non-arsenical, £6 15s. SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. 1d. per lb. LONDON: 1s. 1d. to 1s. 1¼d. SCOTLAND: B.P. crystals, 1s. 1¾d. to 1s. 2d. less 5% carriage paid. MANCHESTER: 1s. 1d.

ALUM.—SCOTLAND: Lump potash, £9 per ton ex store.

ALUMINA SULPHATE.—LONDON: £8 5s. to £9 10s. per ton according to quality and quantity. *£8 10s. SCOTLAND: £8 to £8 10s. ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb. d/d, according to quantity.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £36 per ton; powdered, £38, packed in 5-cwt. casks d/d U.K. stations or f.o.b. U.K. ports.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £19 to £20. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton, carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

ANTIMONY OXIDE.—SCOTLAND: Spot £27 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 4d. to 1s. 6d. per lb. according to quality.

ARSENIC.—LONDON: £24 10s. c.i.f. main U.K. ports for imported material; Cornish nominal, £26 10s. f.o.r. mines. SCOTLAND: White powdered £27 ex wharf; spot, £27 10s. ex store. MANCHESTER: White powdered Cornish, £26 at mines.

ARSENIC SULPHIDE.—Yellow 1s. 6d. to 1s. 8d. per lb.

BARIUM CHLORIDE.—£11 to £11 10s. per ton.

BISULPHIDE OF LIME.—£7 10s. per ton f.o.r. London, packages free.

BLEACHING POWDER.—Spot 35/37% £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 15s. in 5/6 cwt. casks.

BORAX, COMMERCIAL.—Granulated £15 10s. per ton, powder £17, packed in 1-cwt. bags, carriage paid any station Great Britain. Prices are for 1-ton lots and upwards.

CADMIUM SULPHIDE.—3s. 6d. to 3s. 9d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot £5 5s. to £5 15s. per ton d/d station in drums. SCOTLAND: £5 5s. to £5 15s., according to quantity and point of delivery.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—4½d. to 5½d. per lb., ex wharf.

CARBON TETRACHLORIDE.—£45 to £55 per ton, drums extra.

CHROMIUM OXIDE.—10d. to 10½d. per lb. according to quantity d/d U.K. Green 1s. 2d. per lb.

CHROMETAN.—Crystals 3¾d. per lb. Liquor £19 10s. per ton d/d U.K.

COPPERAS GREEN.—SCOTLAND: £3 15s. per ton, f.o.r., or ex works.

CREAM OF TARTAR.—LONDON: £5 2s. 6d. to £5 3s. per cwt.

FORMALDEHYDE.—LONDON: £28 to £28 10s. per ton. *£30. SCOTLAND: 40%, £28 ex store.

HYDROGEN PEROXIDE.—LONDON: *100 vols. 10d. per lb.

LAMPBLACK.—£46 to £50 per ton.

LEAD ACETATE.—LONDON: White £42 to £44 per ton. Brown £1 per ton less. *£40 and £39 respectively ex wharf London. SCOTLAND: White Crystals £42 to £44 c.i.f. U.K. ports. Brown £1 per ton less. MANCHESTER: White, £38, Brown, £36 10s.

LEAD, NITRATE.—LONDON: £28 10s. to £29 per ton; MANCHESTER: £28 10s.

LEAD, RED.—SCOTLAND: £28 10s. per ton d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £40 per ton carriage paid.

LITHOPONE.—30%, £20 to £22 per ton.

MAGNESITE.—SCOTLAND: Ground Calcined £9 per ton ex store.

METHYLATED SPIRIT.—61 O.P. Industrial 1s. 8d. to 2s. 3d. gal. Pyridinised Industrial, 1s. 10d. to 2s. 5d. Mineralised, 2s. 9d. to 3s. 3d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial quality 64 O.P., 1s. 8d. to 2s. 3d.

NICKEL AMMONIA SULPHATE.—£38 per ton d/d.

NICKEL SULPHATE.—£38 per ton d/d.

PHENOL.—LONDON: *7d. per lb.

POTASH CAUSTIC.—£30 to £33 per ton. LONDON and MANCHESTER: £40 to £42.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5¾d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports with allowance for contracts. MANCHESTER: 5d.

POTASSIUM CARBONATE.—SCOTLAND: 96/98% spot £28 per ton ex store. LONDON: £31 10s. to £32 10s. MANCHESTER: £31.

POTASSIUM CHLORATE.—3¾d. per lb. export London in 1-cwt. kegs. LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100% powder, £34. MANCHESTER: £35.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM NITRATE.—SCOTLAND: Refined Granulated £28 per ton c.i.f U.K. ports. Spot £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8½d. to 9d. per lb. SCOTLAND: B.P. crystals, 8½d. MANCHESTER: Commercial, 8d.; B.P., 8½d.

POTASSIUM PRUSSIATE.—LONDON: 8½d. to 9d. per lb. SCOTLAND: Yellow spot material, 8½d. ex store. MANCHESTER: Yellow, 8½d.

SALAMMONIAC.—First lump spot, £42 17s. 6d. per ton d/d address in barrels.

SODA ASH.—58% spot, £6 per ton f.o.r. in bags, special terms for contracts.

SODA, CAUSTIC.—Solid 76/77° spot £14 10s. per ton d/d station. SCOTLAND: Powdered 98/99% £17 10s. in drums, £18 15s. in casks. Solid 76/77% £14 10s. in drums. 70/72% £14 12s. 6d. carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £12 15s. to £14 contracts.

SODA CRYSTALS.—Spot £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—97/98%, £21 per ton.

SODIUM BICARBONATE.—Refined spot £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 10s. ex quay or station. MANCHESTER: £10 10s.

* Prices quoted by other manufacturers.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous 5d. per lb. LONDON: 4d. per lb. with discounts for quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts. MANCHESTER: 4d. less 1 to 3½% contracts, 4d. spot lots.

SODIUM BISULPHITE POWDER.—60/62%, £16 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—2¾d. per lb. LONDON: £30 to £32 per ton. *£32 10s. MANCHESTER: £30.

SODIUM CHROMATE.—3½d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals £15 ex station 4-ton lots. MANCHESTER: Commercial, £9 5s.; photographic, £15.

SODIUM NITRITE.—Spot £19 to £22 per ton d/d station in drums.

SODIUM PERBORATE.—LONDON: *10d. per lb.

SODIUM PHOSPHATE.—£13 to £15 per ton f.o.r. London casks free. LONDON: Dibasic, £13 per ton. MANCHESTER: £13 10s.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 6d.

SODIUM SILICATE.—140° Tw. Spot £8 5s. per ton d/d station returnable drums.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d. SCOTLAND: English material £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground Spot £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d.

SODIUM SULPHIDE.—Solid 60/62% Spot £10 15s. per ton d/d in drums. Crystals Spot £7 15s. per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d. d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11 to £11 10s.; commercial, £8.

SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot £9 10s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £18 per ton f.o.b.

SULPHUR.—£12 5s. to £15 15s. per ton. SCOTLAND: Flowers, £12 10s.; roll, £12 10s.; rock, £9. Ground American, £12 ex store.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 6s. 4d. per lb.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON and SCOTLAND: £12 per ton.

ZINC SULPHIDE.—1s. to 1s. 2d. per lb.

## Pharmaceutical and Photographic Chemicals

THE following price changes are reported:—

BENZONAPHTHOL.—3s. per lb.

CHLORAL HYDRATE.—3s. per lb.

EMETINE BISMUTH IODIDE.—24s. 6d. per oz.

## Essential Oils

ALMOND, FORIGN S.P.A.—11s. per lb.

CAMPHOR, BROWN.—85s. per cwt.

CAMPHOR, WHITE.—105s. per cwt.

CINNAMON.—4s. 3d. per lb.

CASSIA, 80/85%.—5s. 3d. per lb.

CITRONELLA, CEYLON.—2s. 1½d. per lb.

CLOVE, ENGLISH, 90/92%.—5s. 9d. per lb.

EUCALYPTUS, AUSTRALIAN, B.P. 70/75%.—1s. 3d. per lb.

LAVENDER, MONT BLANC, 38/40%.—11s. 6d. per lb.

LEMON.—6s. 6d. per lb.

ORANGE, SWEET.—9s. 6d. per lb.

OTTO OF ROSE, ANATOLIAN.—42s. 6d. per oz.

OTTO OF ROSE, BULGARIAN.—62s. 6d. per oz.

PALMA ROSA.—9s. 6d. per lb.

PEPPERMINT, JAPANESE.—5s. per lb.

PETITGRAIN.—5s. 3d. per lb.

SANDALWOOD, MYSORE.—30s. per lb.

SANDALWOOD, 90/92%.—19s. 3d. per lb.

## Coal Tar Products

ACID, CARBOLIC (CRYSTALS).—5½d. to 6½d. per lb. Crude, 60's 1s. 5½d. to 1s. 6½d. per gal. SCOTLAND: Sixties, 1s. 7d. to 1s. 8d.

ACID, CRESYLIC.—99/100, 1s. 7d. per gal.; B.P., 2s. to 2s. 3d.; Refined, 1s. 10d. to 2s.; Pale, 98%, 1s. 7d. to 1s. 8d.; Dark, 1s. 4d. to 1s. 4½d. LONDON: 98/100%, 1s. 6d. Dark 95/97%, 1s. 4d. SCOTLAND: Pale 99/100%, 1s. 3½d. to 1s. 4½d.; 97/99%, 1s. 1½d. to 1s. 2½d.; dark 97/99%, 1s. 0½d. to 1s. 1½d.; high boiling acid, 2s. 6d. to 3s.

BENZOL.—At works crude 7d. to 7½d. per gal. Standard motor, 1s. 2d. to 1s. 3d.; 90%, 1s. 3d. to 1s. 4d. Pure, 1s. 6d. to 1s. 7d. LONDON: Motor, 1s. 5½d. SCOTLAND: Motor, 1s. 3½d. to 1s. 4½d.; 90%, 1s. 9½d. to 1s. 10½d.

CREOSOTE.—Standard for export, 4¾d. to 5d. nett per gal. f.o.b. for Home, 3¾d. d/d. LONDON: 3d. to 3½d. f.o.r. North; 4d. to 4½d. London. MANCHESTER: 3¾d. to 4¾d. SCOTLAND: Specification oils, 3¾d. to 4¼d.; washed oil, 4d. to 4½d.; light, 4d. to 4½d.; heavy, 4½d. to 5d.

NAPHTHA.—Solvent, 90/160, 1s. 3d. to 1s. 4d. per gal.; 95/160, 1s. 4½d.; 90/190, 11d. to 1s. 1d. LONDON: Solvent, 1s. 1½d. to 1s. 2d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160, 1s. 3d. to 1s. 3½d.; 90/190, 1s. 1d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £9 10s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 65s. to 70s.

PYRIDINE.—90/140, 3s. 9d. per gal.; 90/160, 4s. to 4s. 6d.; 90/180, 2s. 6d. SCOTLAND: 90/160%, 4s. to 5s.; 90/220%, 3s. to 4s.

REFINED COAL TAR.—SCOTLAND: 5d. to 5½d. per gal.

TOLUOL.—90%, 2s. 2d. per gal.; Pure, 2s. 7d.

XYLOL.—1s. 9d. per gal.; Pure, 1s. 11d.

## Intermediates and Dyes

IN the following list of Intermediates delivered prices include packages except where otherwise stated:—

ACID, BENZOIC, B.P. (ex Toluol).—1s. 9½d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100% d/d buyer's works.

ACID, SULPHANILIC.—Spot, 8¼d. per lb. 100% d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb. 100% d/d buyer's works.

*o*-CRESOL 30/31° C.—£2 6s. 5d. per cwt., in 1-ton lots.

*m*-CRESOL 98/100%.—2s. 9d. per lb., in ton lots.

*p*-CRESOL.—34.5° C.—1s. 9d. per lb., in ton lots.

DICHLORANILINE.—2s. 2d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8½d. per lb.

DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 9d. per lb.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

*a*-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

*B*-NAPHTHOL.—Spot, £75 per ton in 1-ton lots, d/d buyer's works.

*a*-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.

*B*-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.

*o*-NITRANILINE.—5s. 10d. per lb.

*m*-NITRANILINE.—Spot, 2s. 6d. per lb. d/d buyer's works.

*p*-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 6½d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

*o*-TOLUIDINE.—Spot, 9½d. per lb., drums extra, d/d buyer's works.

*p*-TOLUIDINE.—Spot, 1s. 9d. per lb., d/d buyer's works.

m-XYLIDINE ACETATE.—3s. 6d. per lb., 100%.

## Nitrogen Fertilisers

SULPHATE OF AMMONIA.—The export market price is about £5 to £5 5s. per ton f.o.b. U.K. port in single bags. There is no shortage of supplies. The home price remains unchanged at £7 per ton delivered in 6-ton lots to consumer's nearest station. The season has now advanced to the stage when demand is decreasing.

BRITISH NITRATE OF SODA is now readily available for farmers.

NITRO-CHALK.—The price remains unchanged at £7 5s. per ton delivered in 6-ton lots to consumer's nearest station. The demand continues satisfactory.

## Latest Oil Prices

LONDON, April 20.—LINSEED OIL was quiet. Spot, nominal; April, £13 5s.; May-August, £13 12s. 6d. September-December, £14 15s.; January-April, £15 10s. per ton, naked. RAPE OIL was slow. Crude extracted, £29 10s.; technical refined, £31 10s. per ton, naked ex wharf. COTTON OIL was dull. Egyptian crude, £21; refined common edible, £24 10s.; and deodorised £26 10s. per ton, naked, ex mill. TURPENTINE was quiet. American, spot, 56s. 6d.; May-June, 54s. per cwt.

HULL.—LINSEED OIL.—Spot closed at £13 2s. 6d.; April at £12 12s. 6d.; May-August, at £13 5s.; September-December at £14 7s. 6d.; and January-April, at £15 2s. 6d. per ton. COTTON OIL.—Egyptian crude, spot, £19 10s.; edible refined, spot, £22; technical, spot, £22; deodorised, £24 per ton, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £21 10s. per ton, naked. GROUNDNUT OIL.—Crushed/extracted, spot, £34; deodorised, £38. RAPE OIL.—Crushed/extracted, spot, £28 10s.; refined, £30 10s. SOYA OIL.—Crushed/extracted, spot, £19 10s.; deodorised, £23 per ton. COD OIL nominal. CASTOR OIL.—Pharmacy, spot, 44s. 6d.; first, 30s. 6d.; second, 34s. 6d. per cwt.

* Prices quoted by other manufacturers.

# Commercial Intelligence

*The following are taken from printed reports, but we cannot be responsible for any errors that may occur.*

## London Gazette, &c.

### Company Winding Up

THE MERCURY MANUFACTURING CO., LTD. (C.W.U., 23/4/32.) Winding-up order, April 11, 1932.

## Mortgages and Charges

*[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]*

ALLIANCE ARTIFICIAL SILK, LTD., Oulton Broad. (M., 23/4/32.) Registered April 12, £1,180 debentures, part of £363,000; charged on properties at Oulton Broad, also general charge. *Nil. April 8, 1930.

SILVER SPRINGS BLEACHING AND DYEING CO., LTD., Congleton. (M., 23/4/32.) Registered April 12, £6,000 debentures; general charge. *£22,678. September 22, 1930.

## Information Required

*We receive so many inquiries from readers as to technical, industrial, and other points, that we have decided to make a selection for publication. In cases where the answers are of general interest, they will be published; in others, the answers will simply be passed on to the inquirers. Readers are invited to supply information on the subjects of the queries:—*

176. SACHSENBURG PATENT SULPHUR BURNER.—A reader wishes to get into touch with a firm or firms in this country using a Sachsenburg patent sulphur burner, which was sold by the Sachsenburg/London Engineering Co., with offices at Carlton Chambers, 12 Regent Street, London, before the war. He understands that quite a number of these burners were sold for the purpose of making $SO_2$.

177. RAGNASARA.—An American firm desires information about a British product with the trade name "Ragnasara," a solution used in treating rubber sheets, said to have been perfected by a chemist in the Malay States, H. J. R. Kulasingha.

## New Companies Registered

A. L. ARNOLD AND CO., LTD. Registered April 19. Nominal capital £11,000. Manufacturers of and dealers in chemicals, fine chemicals, and chemical intermediates, salts, acids, gases and disinfectants, etc. Directors: L. S. Burt; A. E. Harris (managing director), 27 Glenhouse Road, Eltham, London, S.E.9; and A. L. Arnold.

ART GLASSWORKS (LONDON), LTD., 86 Hatton Garden, E.C.1. Registered April 9. Nominal capital £100 in £1 shares. Manufacturers, importers and exporters of glass and glassware of all kinds, glass bottles, etc., and to adopt agreements with Kiva Lehrer and E. Szekely. Directors: Eugene Szekely, 16 Cleve Road, Hampstead, N.W., and Kiva Lehrer.

THE CHEMICAL AND BIOLOGICAL PRODUCTS CO., LTD. Registered April 8. Nominal capital of £2,000 in 1s. shares. Manufacturers of and dealers in chemicals, biological products, pharmaceutical (including toilet) preparations, medicines and remedies of all kinds for men, animals or for agricultural or other purposes, etc. Directors: L. Zisserman, 48 Alexandra Grove, North Finchley, N.12; and C. C. Inchbold.

THORNHILL, ZIMMERMANN AND LEHMANN, LTD., 59 Mark Lane, E.C.3. Registered April 9. Nominal capital £3,000 in £1 shares (2,000 founders' and 1,000 ordinary). General merchants, manufacturers of and dealers in cleaning materials, cleansers, detergents and other similar preparations and articles, etc. Directors: G. H. Thornhill, The Hatch, Chalfont St. Giles; R. C. P. Philp, A. Lehmann, Wilhelm Zimmermann, and Werner Zimmermann.

## New Chemical Trade Marks

*Compiled from official sources by Gee and Co., Patent and Trade Mark Agents, Staple House, 51 and 52 Chancery Lane, London W.C.2.*

*Opposition to Registration can be lodged up to May 13.*

**Black Leaf 40.—529,610.** Class 2. Chemical substances used for agricultural and horticultural purposes. Tobacco By-Products and Chemical Corporation, 1350 South Seventeenth Street, Louisville, Kentucky, U.S.A. Feb. 22, 1932.

**Porosine.—529,066.** Class 4. Mineral substances (raw or partly prepared) for mixing with glue for the purpose of preventing the glue from penetrating the pores of the woodveneers. Walter Sydney Farmer, trading as the Stainax Co., 1/5 Garden Row, London Road, S.E.1. Feb. 2, 1932.

## Chemical Trade Inquiries

*Abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).*

AUSTRALIA.—A Melbourne firm dealing in sanitary ware, etc., contemplates starting an agency business and desires to represent United Kingdom manufacturers of industrial chemicals, paints, ceramics, etc. (Ref. No. 681.)

BRITISH INDIA.—A Parsee importing firm in Bombay desires to obtain United Kingdom agencies for chemicals for mills, soap, etc., Bombay Presidency. (Ref. No. 683.)

BRITISH INDIA.—A British firm in Calcutta desires commission agencies for perfumery and toilet requisites, etc., for Bengal and Behar and Orissa. (Ref. No. 687.)

FINLAND.—A firm of agents established at Helsingfors desires to obtain representation of United Kingdom exporters of soya oil and ground nut oil. (Ref. No. 709.)

INDIA AND BURMA.—A British firm in Calcutta representing American manufacturers of cellulose lacquers, spraying equipment, etc., wishes to replace these agencies by connections with United Kingdom manufacturers. The firm desires agencies on a purchasing basis and can cover the whole of India and Burma. (Ref. No. 698.)

SOUTH AFRICA.—A firm of manufacturers' representatives in Cape Town desires to secure representation of a United Kingdom supplier of soya bean oil. (Ref. No. 701.)

SPAIN.—An agent in Barcelona wishes to get into touch with United Kingdom manufacturers of chemicals for the tanning and dyeing industries with a view to representation. (Ref. No. 722.)

TRIPOLI (LYBIA).—A firm of commission agents in Tripoli desires business with United Kingdom firms dealing in refined soya oil, ground nut oil, etc. (Ref. No. 726.)

## Tariff Changes

CZECHOSLOVAKIA.—Orders have been issued by the Czechoslovak Minister of Commerce which subject the importation into Czechoslovakia of casein (other than casein imported under permit for the manufacture of artificial horn) and casein glue to import licence requirements from March 1.

LATVIA.—A law, effective as from March 16, amends previous legislations governing the payment of excise duty on naphtha products. The revised law provides that earth resins and products distilled from naphtha, brown coal and shale shall be assessed with duty at the following rates:—

| | Duty per kilog. |
|---|---|
| (1) Petrol (benzine), its distillates, and naphtha by-products having a specific gravity of up to 0.790 at 15° C. ... ... ... ... ... ... | 6 sant |
| (2) Kerosine having a specific gravity of 0.790 to 0.850 at 15° C. and a flash-point not below 23° C. according to the Abel-Pensky apparatus. | Free |
| (3) Solar oil and lubricants and their distillates having a specific gravity greater than 0.850 at 15° C., vaseline-cerasin, paraffin and earth resins ... ... ... ... ... ... ... | 15 sant |

SWITZERLAND.—An order, dated March 12 and effective on publication, provides that a licence must be obtained for the import into Switzerland, at the normal rate of duty, of prepared fertilisers, superphosphates, and artificial fertilisers packed loose in sacks, barrels, etc. (Tariff No. 169.), originating in the Netherlands.